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ABSTRACT

Designed to supplement the mathematics-science curriculum, this booklet contains activities which provide students of grades three and four with opportunities for investigating the weather and natural environment. Fourteen mathematics skills and six science processes are listed and indexed for the five activities on weather, four activities on plants and animals, two on pollution, and the four which focus on soils and rocks. Each activity consists of student sheets and a teacher's guide. The teacher's guide contains information on the activities including: (1) topic area; (2) introductory statement; (3) math and science skills; (4) required materials; (5) key questions; (6) background information; (7) management details; (8) instructional procedures; (9) student procedures; (10) discussion questions; (11) activity extensions; and (12) curriculum coordinates. (ML)

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Overhead and Underfoot

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PROJECT AIMS

Grades 3–4

SE 048 231

Overhead and Underfoot

Book D—Grades 3-4

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Project AIMS

Project AIMS has as its purpose the integration of subject matter in K-9. Such integration enriches and makes learning meaningful and holistic. Project AIMS began as a program to integrate mathematics and science, but has since developed to also include language arts, social studies, and other disciplines. The acronym "AIMS" stands for "activities to integrate mathematics and science."

Project AIMS is a continuing, non-profit project of Fresno Pacific College. It had its inception in a National Science Foundation funded program to train teachers in the integration of mathematics and science. This quickly created the necessity to write instructional materials incorporating this concept. Despite the fact that thoughtful educators have long recommended this approach, very little appropriate material was available.

Currently, Project AIMS is funded solely through the sale of this developing series of books. All net proceeds from their sale flow into a trust fund administered by Fresno Pacific College. The use of this fund is restricted to the support of continued research and development, partial scholarships for classroom teachers who participate in the writing and field testing teams, and the publication of the books.

Two writing teams have completed their work. The first consisted of seventy-five teachers in grades 5-9 who met over a period of eighteen months. The second involved thirty-five K-4 teachers who wrote during a two-year span. In the fall of 1985 a third team of approximately fifty teachers in grades 2-9 will begin writing. In addition, over a hundred teachers have been involved in field testing newly created materials.

The rationale for this integrative thrust lies in the fact that science, mathematics, language arts, social studies, etc., are integrally interwoven in the real world outside the classroom, from which it follows that they should be similarly treated in the classroom if we are to prepare our students for life in that world. Teachers who have used Project AIMS lessons give enthusiastic endorsement to the effectiveness of this approach.

Science encompasses the art of questioning, investigating, hypothesizing, and discovering. Mathematics is the language that provides clarity, objectivity, and understanding. The language arts provide us with powerful tools of communication. Many of the major contemporary issues involve societal issues stemming from advancements in science. It is time, therefore, that all of us in the teaching profession take seriously using a more holistic mode of transmitting knowledge to students. It is this that motivates all of us who are involved in creating or using the integrative materials of Project AIMS. We invite you to join us in this effort.

Extensive field testing of these materials confirms the following beneficial results.

1. Mathematics becomes more meaningful, hence more useful, when it is applied to situations that interest students.

2. The extent to which science is studied and understood is increased, with a significant economy of time resulting from the integration of two or more disciplines.

3. There is improved quality of learning and retention, supporting the thesis that learning which is meaningful and relevant is more effective.

4. Motivation and involvement are increased dramatically as students investigate real world situations and participate actively in the process.

We invite you to become part of this classroom teacher movement by using an integrated approach and by sharing any suggestions you may have or investigations you would recommend. Project AIMS welcomes you!

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Project AIMS Publications

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From Head to Toe
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I HEAR, AND I FORGET

I SEE, AND I REMEMBER

I DO, AND I UNDERSTAND

–Chinese Proverb

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Introduction

Overhead and Underfoot is littered with weather and natural environment investigations. Students will be actively "engauged" in experiences with weather, plants, soil, geology, and conservation.

We predict the weather investigations will seed an awareness of natural phenomena. Students will actually cycle through activities with weather stations and develop a new understanding of weather concepts and measurement skills. Cloud formations, relative humidity, brisk breezes, drizzling rain, barometric pressure, and elusive shadows will brighten the budding young meteorologist's mind.

Get out your shovels to dig into nature's treasures while investigating soil composition, pollution, insect travel, animal identification and safety. Students will be "oozing" with enthusiasm over peanut butter and jelly "rock" layers as they explore the mysteries of geology. Enjoy camouflaging math concepts and science processes with these earthy experiences and comparisons of soil types and plant growth.

Ground your students' knowledge in weather and natural environment by exploring these activities. To prevent students' interest from evaporating, encourage individual "digs" into further extensions and advanced study.

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SUNNY-SIDE UP

I. **Topic Area**

Shadows

II. **Introductory Statement**

Students will discover information about the relationship of the earth to the sun by studying shadow patterns.

III. **Math Skills**

Measuring length
Graphing
Numerical ordering
Averaging, median

Science Processes

Predicting
Observing
Gathering/recording data
Generalizing

IV. **Materials**

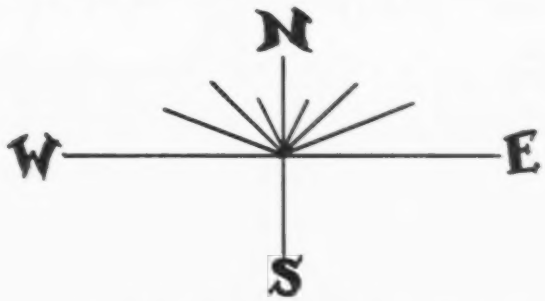
directional compass
5 identical shadow objects such as rulers
clay
5 meter sticks
chalk
overhead transparency of graph (optional)

V. **Key Question**

How do shadows change during the day?

IV. **Background Information**

Shadows are longest in the early morning and late afternoon, when the sun is the lowest on the horizon. They are shortest near noon, when the sun is at its highest point in the sky. The earth spins eastward on its axis as it moves around the sun. Because the earth's axis is tilted, the sun shines on the earth from a southerly position. In the Northern Hemisphere, shadows are formed to the north of the east-west axis on a compass rose.



The angle of the sun's rays changes with the seasons. Although the sun is closer to the earth in December in the Northern Hemisphere, July is hotter because the sun strikes closer to a right angle then.

VII. **Management**

Day 1: This activity takes an initial discussion of about 30 minutes. Divide the class into five groups; a different person from each group will measure every hour. Five pieces of data will be gathered each time, most likely different. This data will later be used for two purposes—finding the median average and discussing inconsistencies in measuring. Chance of human error means the broader the sample, the more accurate and reliable the results.

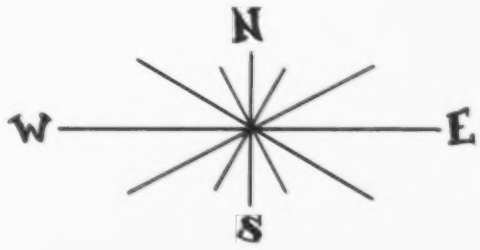
Day 2: About 45 minutes is needed to fill in the graph and answer the questions.

VIII. **Procedure**

Day 1: Before class, use the compass and chalk to draw five separate compass roses on the cement or blacktop, one for each group.

Pose the key question: How do shadows change during the day? On the worksheet, have students draw their shadow line predictions on the first compass rose and fill in the times measurements are to be taken on the group chart.

Decide if measuring will be done to the nearest cm, nearest half cm, etc.



Sample Prediction

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For the first measure, the entire class should go out and get acquainted with the procedure; stress accuracy. Stand the ruler or chosen object *straight* up in the clay, draw a chalk line along the shadow to its tip, take the clay off the compass rose and measure from the crossing point of the rose to the end of the line.

Day 2: Write each group's reported results of the first measure on the board. Then students can rearrange the five numbers from the smallest to largest and record under Class Results. They should circle the middle number; this is the median average. Repeat this process for the rest of the chart.

Discuss the range of shadow lengths (shortest-longest) and decide together the best increments for the graph—2's, 5's, 10's, etc. An overhead transparency is helpful.

Write these increments along the left side of the graph labeled Shadow Length in Centimeters. For instance, if the shortest and longest shadow measurements are 37 cm and 84 cm, respectively, you should number the graph by 5's.

Write the measurement times along the bottom of the graph.

Fill in the graph together and discuss the questions.

IX. What the Students Will Do

Day 1:

1. Students will measure the shadow object and record.
2. Students will predict shadow patterns by drawing lines on the first compass rose.
3. Students will be placed in five groups; each group will choose a different person to measure every hour. The entire class will go out for the first measure to learn correct procedure.
4. Every hour, the chosen student from each group will draw, measure, and record the shadow information using the outdoor compass rose assigned to his/her group.
5. Either now or on the second day, students will record their group's data and view their outdoor compass rose. Then they will draw actual shadow lines on the second rose on the worksheet.

Day 2:

1. Students will report their group's data.
2. Students will record the information from all the groups in numerical order under Class Results.
3. Students will determine the range and increments for the graph with the teacher's guidance.
4. Students will write the increments on the left side of the graph and the measurement times along the bottom.
5. Using the median average, students will fill in the graph, answer questions, and make generalizations.

X. Discussion

1. Why were there differences in our measurements?
2. In which direction(s) did the shadows fall? Why? (from west to east on the north side of the east-west axis, see Background Information)
3. How did the shadow lines change? (in direction and length)
4. When were they shortest? (near noon, when the sun is at its highest point)
5. If you lived in the Southern Hemisphere, where would the shadows fall? (to the south of the east-west axis)
6. What would the shadow look like if the sun was directly overhead? (there wouldn't be one.)
7. Hows does daylight savings time affect the time of the shortest shadow? (It will vary between 11:00 and 1:00.)

XI. Extensions

1. Do this investigation during two different seasons of the year and compare information.
2. Take measurements for several days, compare, and average. Were measurements accurate?

XII. Curriculum Coordinates

1. ***Social Science:*** Look up information on sun dials and how to read them.
2. ***Creative Writing:*** Write a story about your shadow—how it became attached to you, the time it got in the way, etc.
3. ***P.E.:*** Strike a pose, have someone trace around it. Then see if another student can fill the same space.
4. ***Art:*** Do a shadow collage. Cut an interesting but simple shape out of construction paper or tag. Take a pencil, paper, and the shape outside. Hold it one way and quickly trace. Change it to make different shadows and trace each one. Insides may be colored.

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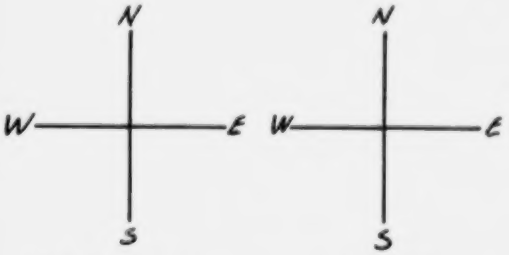
NAME _____

SUNNY-SIDE UP

HOW DOES THE SUN SEEM TO CROSS THE SKY?



PREDICTION ACTUAL

WE ARE MEASURING THE SHADOW OF _____, ____ CM LONG.

IN WHICH DIRECTION(S) DID THE SHADOWS FALL? _____

_____

HOW DID THE SHADOWS CHANGE? _____

WHEN WERE THEY SHORTEST? _____

GROUP

RECORDER'S NAME	TIME	SHADOW LENGTH	CLASS RESULTS (SMALLEST TO LARGEST)
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___
			___ ___ ___ ___ ___

CIRCLE THE MIDDLE NUMBER. THIS IS THE MEDIAN AVERAGE.

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NAME _____

SUNNY-SIDE UP

SHADOW LENGTH IN CENTIMETERS

TIME OF DAY

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WHEN IT'S HOT IT'S HOT

I. **Topic Area**

Meteorology (temperature)

II. **Introductory Statement**

Students will learn to read a thermometer, will compute the average temperature per day and will graph the results.

III. **Math Skills**

Measuring
Computation
Graphing

Science Processes

Predicting
Gathering/recording data
Applying/Generalizing

IV. **Materials**

thermometer

V. **Key Question**

What does temperature have to do with the way we feel about the weather?

VI. **Background Information**

Temperature is the single most well-understood factor included in a weather report. Comments about the quality of the weather usually refer to the temperature for the day. Weather forecasts usually predict the high and low temperature for the day. Though students should be aware of the high and low temperature in their reporting, this activity stresses the overall quality of the day's weather by reporting the average daily temperature.

VII. **Management**

This is an on-going activity which can be used by itself or in conjunction with other weather lessons presented in this book. It is suggested that the class be divided into weather forecasting groups with students taking turns collecting the data. This lesson calls for four temperature readings per day. The readings should take very little time. You should allow for a 5 to 10 minute period at the end of the day for computation, recording, and sharing of the day's weather data.

VIII. **Procedure**

1. Have several outdoor thermometers available to the class.
2. Demonstrate to the class how to read a thermometer.
3. Ask the key question.
4. Divide the class into weather groups and assign a part of each group to be responsible for taking the temperature readings. Students should switch jobs each week to allow everyone to have experience with all facets of weather measurement.

IX. **What the Students Will Do**

1. Students will take temperature readings four times per day at the times indicated on the student worksheet.
2. Using the table on the worksheet, students will compute the average temperature for the day.
3. Students will graph the average temperatures for the day as well as the high and low temperatures for the day.

X. **Discussion**

1. What is a hot day?
2. What is a cold day?
3. What is the temperature likely to be on a day when there is frost on the ground?

XI. **Extensions**

1. Check the newspaper for the weather map of your area and compare your data with the official forecast for the area. Find out where they collect data in your area.
2. Visit a weather station. Check with TV news or airports.
3. The WEATHER REPORT AND FORECASTING page is designed to be used to tie all of the information from the weather stations together on a daily basis. Students simply record their findings for each investigation in one column and then note the meaning of the data in the next. Students can then use this information to predict what the weather will be for the next day. With practice in interpreting this data students should find that they can become quite proficient at weather forecasting.
4. Do a study of how temperature is affected by the placement of the thermometer.

XII. **Curriculum Coordinates**

1. Learn about the importance of temperature in baking by doing some cooking lessons.
2. Study about the survival temperatures for various animals including the human animal.

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NAME _____

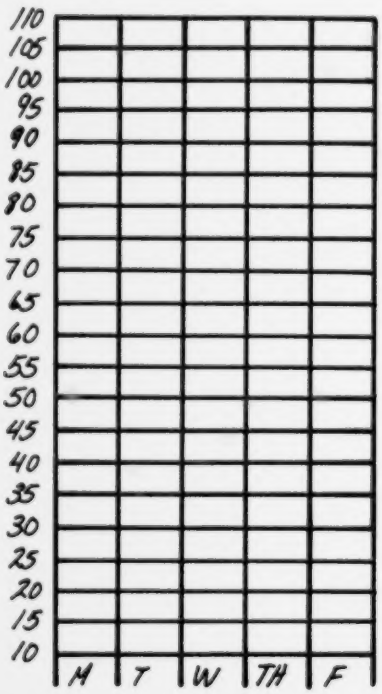
WHEN IT'S HOT IT'S HOT

1. TAKE TEMPERATURE READINGS FOUR TIMES PER DAY. COMPLETE THE TABLE BELOW BY FINDING THE TEMPERATURE AVERAGE FOR EACH DAY.

	8 AM	10 AM	12 NOON	2 P.M.	TOTAL	÷ 4	AVER. TEMP
MONDAY						÷ 4	
TUESDAY						÷ 4	
WEDNESDAY						÷ 4	
THURSDAY						÷ 4	
FRIDAY						÷ 4	

2. GRAPH THE HIGH TEMPERATURE, LOW TEMPERATURE AND AVERAGE TEMPERATURE FOR EACH DAY OF THE WEEK USING THE LINE GRAPH ON THE RIGHT

KEY	KEY
HIGH →	RED
LOW →	BLUE
AVER. →	GREEN



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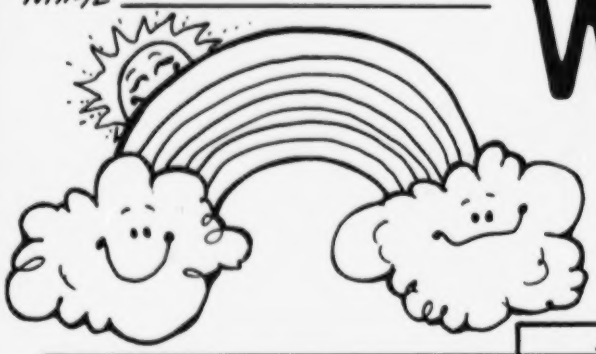

WEATHER REPORT

	DATA	MEANING
WIND SPEED		
WIND DIRECTION		
AIR PRESSURE		
TEMPERATURE		
HUMIDITY		
CLOUDS		
RAINFALL		

AND FORECAST

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IT'S IN THE WIND

I. **Topic Area**

Meteorology (wind)

II. **Introductory Statement**

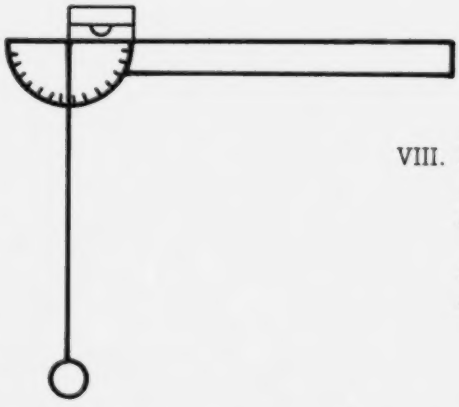
Students will learn to measure wind speed and direction using an anemometer and wind vane and will graph the results.

III. **Math Skills**

- Measurement
- Graphing
- Computation
- Geometry (using a modified protractor)

Science Processes

- Gathering/recording data
- Interpreting data



IV. **Materials**

- rulers or sticks
- protractor
- string
- ping pong ball
- balance bubble board
- cardboard

Please see the instruction sheet for the construction of the anemometer and wind vane for size specifications.

V. **Key Question**

How much does wind speed and direction change from day to day?

VI. **Background Information**

Wind speed and direction vary from day to day. An anemometer is a device for measuring wind speed. A wind vane is used to measure wind direction. A PREVAILING WIND is the wind most common to the region. It is named after the direction of its origin. A WIND MAP is a graphing device used to show both wind speed and direction.

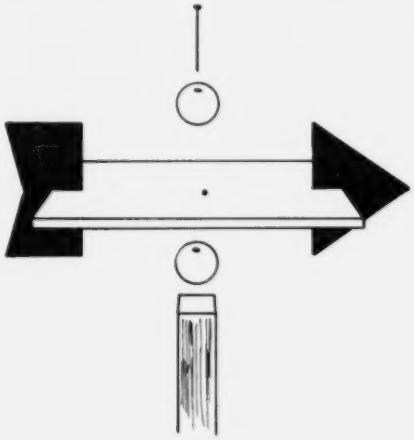
Wind speed and direction are important in forecasting weather since they determine the movement of weather systems.

VII. **Management**

This is an on-going activity which can be used by itself or in conjunction with other weather lessons presented in this book. It is suggested that the class be divided into weather forecasting groups with students taking turns collecting the data. This lesson calls for four wind readings per day. The reading should take no longer than 5 minutes each. You should allow for a 10 to 15 minute period at the end of the day for computation, recording and sharing of the day's weather data. Having your weather groups compare wind data at the end of the day is a good way to encourage careful measurement.

VIII. **Procedures**

1. Build several anemometers and wind vanes.
2. Demonstrate to the class how these instruments are used.
3. Ask the key question.
4. Divide the class into weather groups and assign a part of each group to be responsible for wind data for the week. Students should switch jobs each week to allow everyone some experience with all facets of weather measurement.



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IX. **What the Students Will Do**

WIND SPEED

1. Students should work in pairs. Student A should face into the wind holding the anemometer level and away from the body. With no wind the string stretched across the protractor should read 90 degrees. As the wind blows, the ping pong ball will move with it pulling the string across the protractor. Student B should note the angle indicated by the string.
2. Using the chart on the student worksheet, the students should convert their angle reading to wind speed and record in the appropriate time box on the worksheet.
3. Four readings per day should be taken and then averaged to give a wind speed for the day. Daily wind speed data can be recorded on the WIND DATA worksheet.

WIND DIRECTION

1. Wind direction should be measured using the wind vane four times daily. The wind vane should be placed in the open as free from obstacles as possible.
2. One student can take the wind direction data.
3. Wind direction data should be recorded on the WIND DATA worksheet. After obtaining this data, the student will need to make a decision regarding the prevailing wind for the day. As an example, readings of north, north, northeast would result in a wind direction of north for the day.

   WIND SPEED AND WIND DIRECTION DATA SHOULD BE COMBINED AT THE END OF THE WEEK FOR GRAPHING.

X. **Discussion**

1. What is the prevailing wind for the day?
2. Did it change from yesterday?
3. Where was today's weather yesterday? (Look at a map and discuss cities the wind might have passed through).

XI. **Extensions**

1. Check the newspaper for the weather map of your area and compare your data with the official weather data and forecast.
2. Visit a weather station. Check with TV news or airports.
3. The WEATHER REPORT AND FORECASTING page is designed to be used to tie all of the information from the weather stations together on a daily basis. Students simply record their findings for each investigation in one column and then note the meaning of the data in the next. Students can then use this information to predict what the weather will be for the next day. With practice in interpreting this data students should find that they can become quite proficient at weather forecasting.

XII. **Curriculum Coordinates**

1. Read stories about kites and kite flying.
2. Study about Wilbur and Orville Wright and their wind studies.
3. Release helium balloons with postcards attached asking finder to mail location of the balloon when found. This is an excellent and very graphic way to study the movement of the wind.

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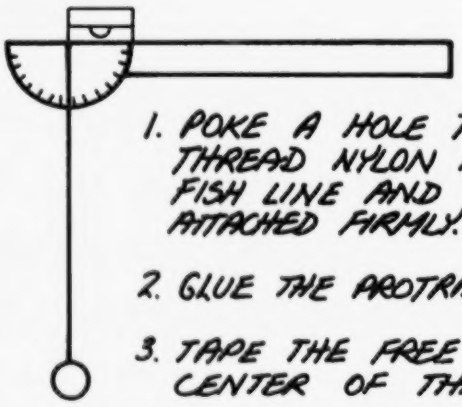
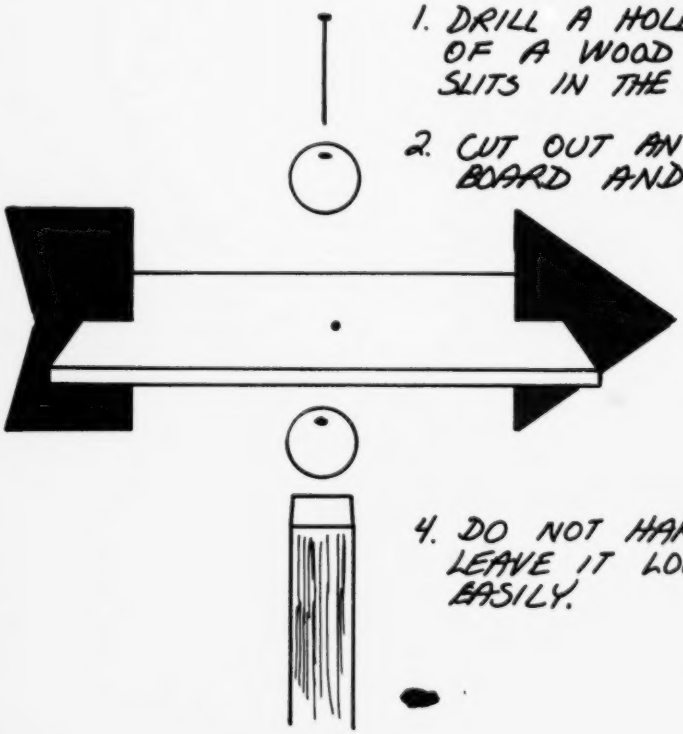
DIRECTIONS



ANEMOMETER

1. POKE A HOLE THROUGH THE PING PONG BALL AND THREAD NYLON FISH LINE THROUGH IT. KNOT THE FISH LINE AND GLUE IT TO THE BALL SO IT IS ATTACHED FIRMLY.
2. GLUE THE ARCTRACTOR TO A STRAIGHT STICK.
3. TAPE THE FREE END OF THE FISH LINE TO THE CENTER OF THE ARCTRACTOR.
4. GLUE THE "LEVEL BUBBLES" TO THE TOP OF THE STRAIGHT EDGE.

WIND VANE



1. DRILL A HOLE THROUGH THE CENTER OF A WOOD BOARD 3"X 15". CUT SLITS IN THE END OF THE BOARD.
2. CUT OUT AN ARROW & TAIL FROM CARD-BOARD AND GLUE THEM INTO THE SLITS.
3. MOUNT THE POINTER BETWEEN TWO BEADS BY PASSING A LONG NAIL THROUGH THE HOLES AND INTO A 2"x 2" STICK ABOUT 5' LONG.
4. DO NOT HAMMER DOWN TIGHTLY, BUT LEAVE IT LOOSE SO THAT IT ROTATES EASILY.

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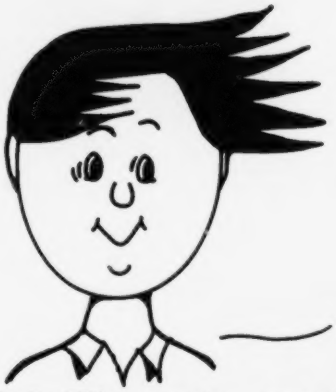
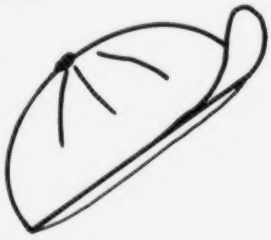


IT'S IN THE WIND



USE THE WIND SPEED CHART AND THE ANEMOMETER TO FIGURE THE WIND SPEED AVERAGE FOR THE DAY.

WIND SPEED CHART

ANGLE	SPEED
90°	0
85°	6
80°	8
75°	10
70°	12

ANGLE	SPEED
65°	13
60°	15
55°	16
50°	18
45°	20

ANGLE	SPEED
40°	21
35°	23
30°	26
25°	29
20°	33

	ANGLE	SPEED
8		
10		
12		
2		

1. FIND THE ANGLE ON THE ANEMOMETER.
2. USE THE CHART TO FIND THE WIND SPEED.
3. AFTER THE THREE READINGS HAVE BEEN TAKEN ADD THEN DIVIDE TO FIND THE DAILY AVERAGE.

_____

_____ ÷ 4 = _____

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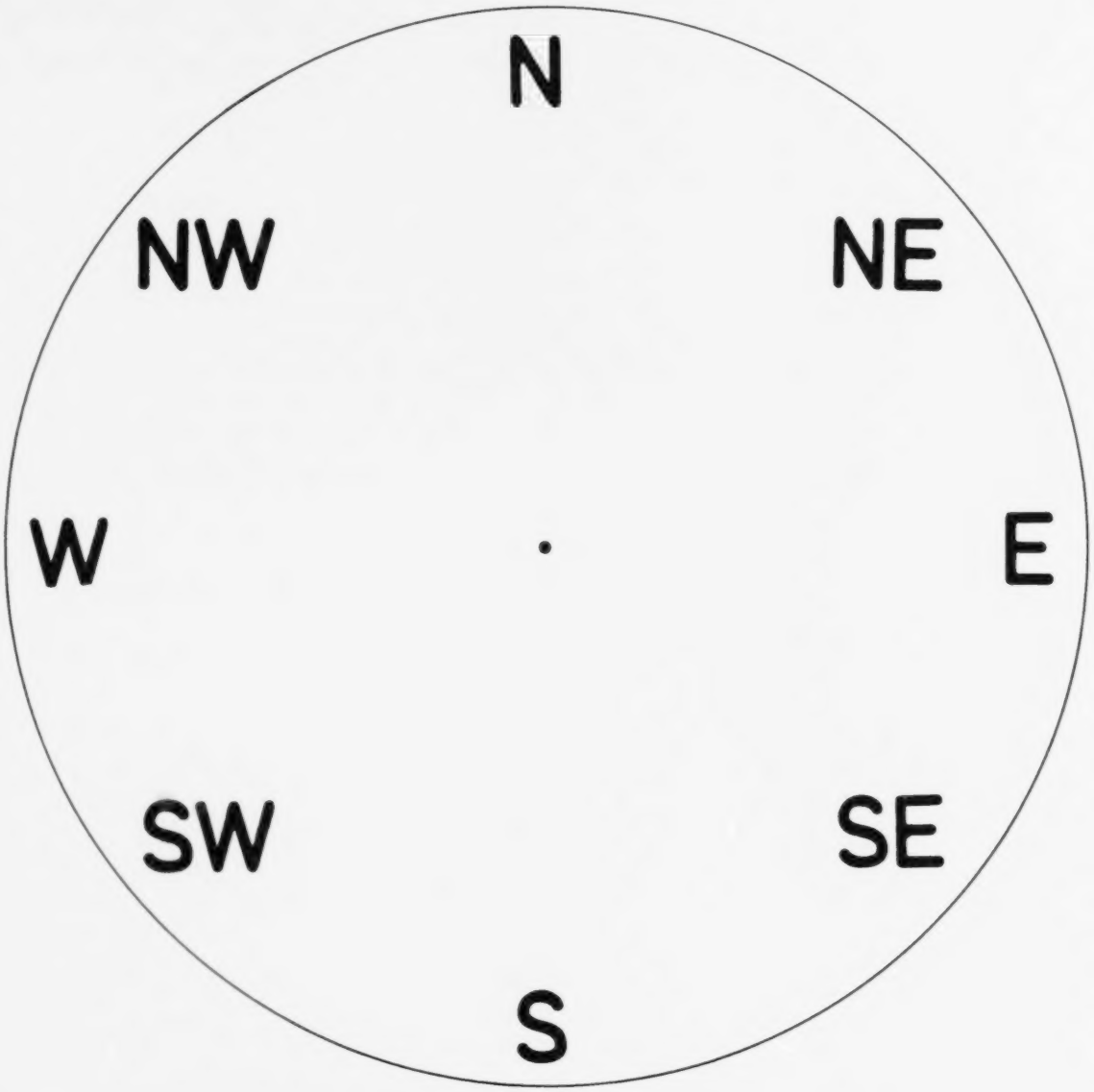
NAME _____

WIND MAP

1. START AT THE DOT IN THE MIDDLE OF THE GRAPH.
2. DRAW A STRAIGHT LINE FROM THE DOT TOWARD THE DIRECTION OF THE WIND FOR THAT DAY.
3. EVERY CENTIMETER IN LENGTH EQUALS FIVE MILES.
4. USE A DIFFERENT COLOR FOR EACH DAY.

☐ MONDAY ☐ TUESDAY ☐ WEDNESDAY ☐ THURSDAY ☐ FRIDAY



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NAME _____

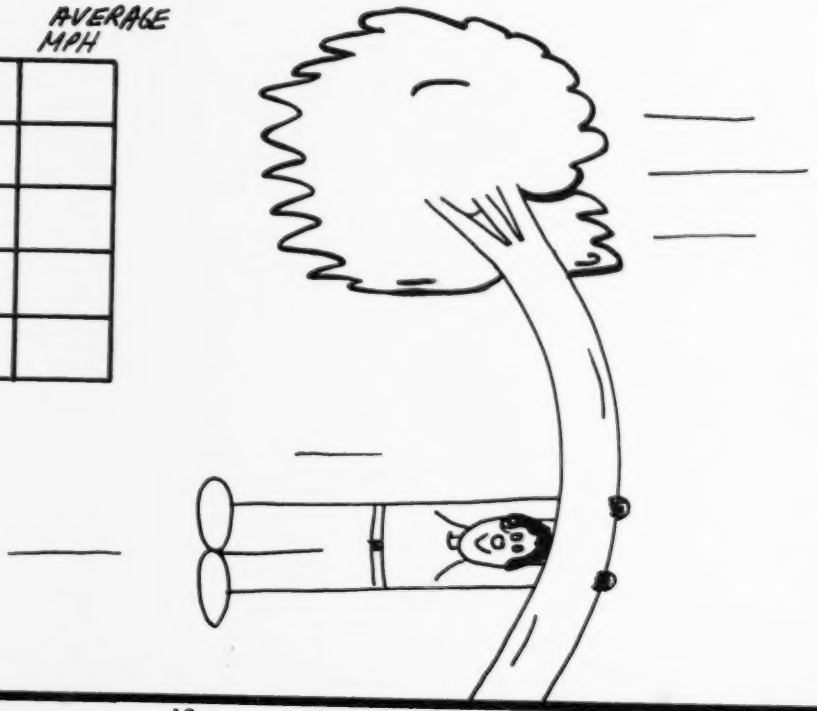
WIND DATA

DIRECTION

	TIMES 8	10	12	2	
MONDAY					
TUESDAY					
WEDNESDAY					
THURSDAY					
FRIDAY					

SPEED

	AVERAGE MPH
MONDAY	
TUESDAY	
WEDNESDAY	
THURSDAY	
FRIDAY	



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HIGHS AND LOWS

I. **Topic Area**

Meteorology (air pressure)

II. **Introductory Statement**

Students will learn the meaning of air pressure and how it relates to weather. They will take twice daily readings and graph their data.

III. **Math Skills**

Measuring
Graphing

Science Processes

Gathering/recording data

IV. **Materials**

glass jar or thermos
balloon
rubber band
straw
glue

V. **Key Question**

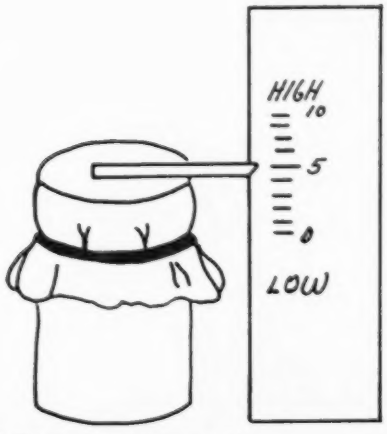
What is air pressure and how does it affect our weather?

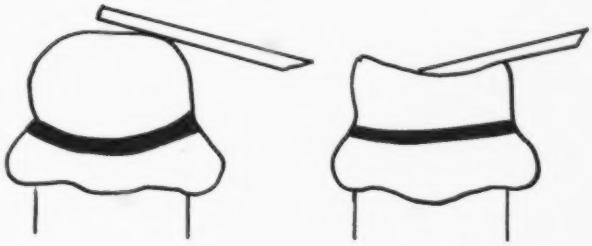
VI. **Background Information**

A barometer measures the pressure of air molecules. When air is cool, air molecules are closer together and move slower. Cooling air means that air pressure is increasing and is referred to as high pressure. The reverse is true for warming air. Warm air causes air molecules to spread farther apart and move faster. Warm air usually means low pressure.

VII. **Management**

This is an on-going activity which can be used by itself or in conjunction with other weather lessons presented in this book. It is suggested that the class be divided into weather forecasting groups with students taking turns collecting the data at the various weather stations. This lesson calls for two air pressure readings per day and should take very little time. As with the other weather lessons in this book, you should allow a 5 or 10 minute period at the end of the day for graphing.





VIII. **Procedure**

1. Follow the instructions on the student worksheet for construction on the barometers.
2. Set up the barometers the day before you begin your collecting of data.
3. Ask the key question.
4. Divide the class into weather groups and assign a part of each group to be responsible for taking the air pressure reading each day. Students should switch jobs each week to allow everyone to have experience with all facets of weather measurement.

IX. **What the Students Will Do**

1. Make the barometers.
2. Collect data twice daily.
3. Record and graph data.

X. **Discussion**

1. What is air pressure?
2. How does air pressure affect our weather?

XI. **Extension**

1. Check a newspaper for the weather map and notice the highs and lows and how they relate to movement of weather systems.
2. The WEATHER REPORT AND FORECASTING page is designed to be used to tie all of the information from the weather stations together on a daily basis. Students simply record their findings for each investigation in one column and then note the meaning of the data in the next. Students can then use this information to predict what the weather will be for the next day. With practice in interpreting this data students should find that they can become quite proficient at weather forecasting.

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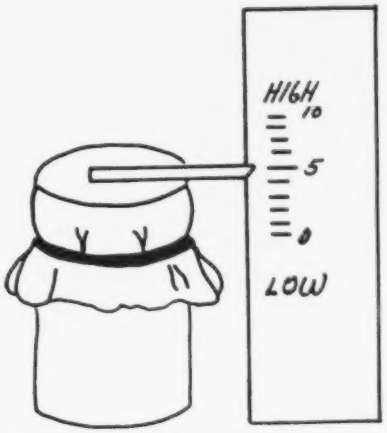
HIGHS AND LOWS

BAROMETER

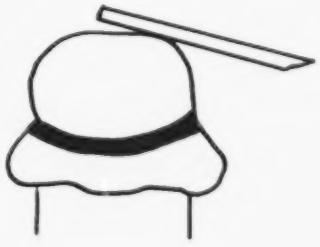


DIRECTIONS

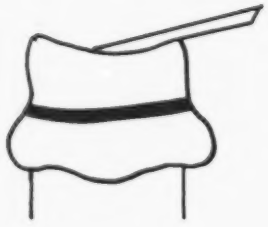
1. CUT A BALLOON AND STRETCH IT OVER A GLASS JAR OR THERMOS BOTTLE.
2. SECURE THE BALLOON IN PLACE WITH RUBBER BANDS.
3. GLUE A STRAW ONTO THE BALLOON AS SHOWN.
4. FOLD THE SCALE PROVIDED & ARRANGE SO THAT THE STRAW POINTS TO THE 5. BOOKS CAN BE USED TO ADJUST THE HEIGHT.

HOW IT WORKS

WHEN PRESSURE IS LOW OUTSIDE, THE STRAW GOES DOWN INDICATING BAD WEATHER.



WHEN PRESSURE IS HIGH, THE STRAW GOES UP INDICATING GOOD WEATHER.



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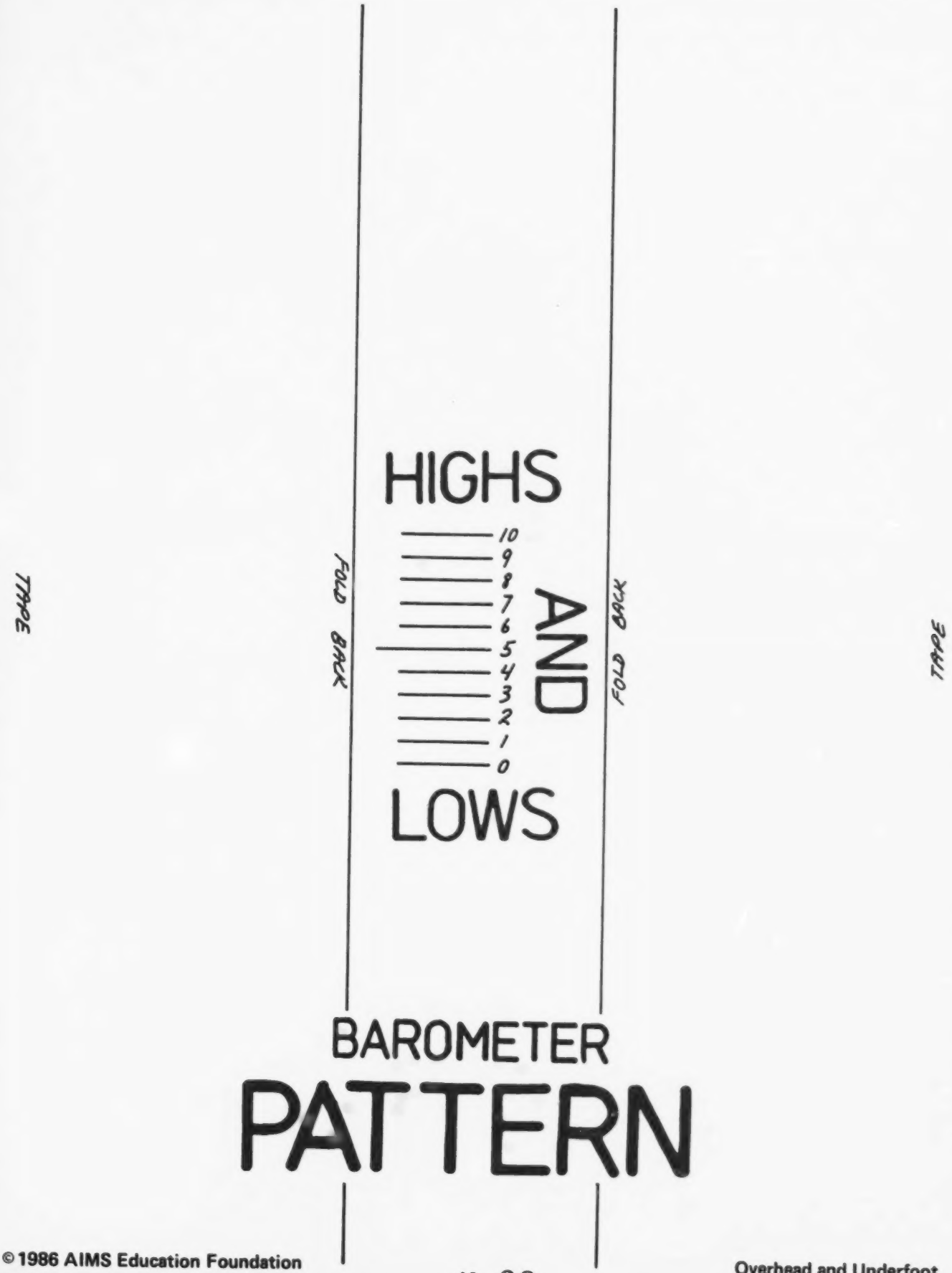

BAROMETER PATTERN

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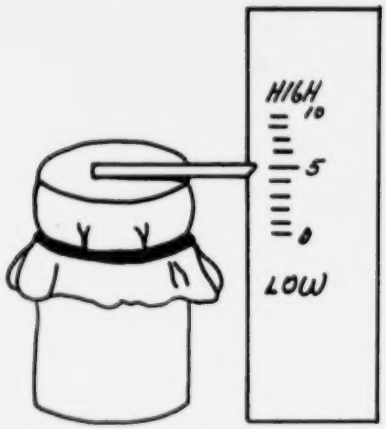
NAME_____

HIGHS AND LOWS

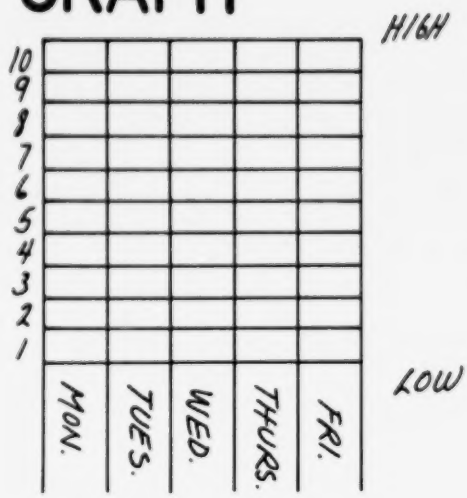
BAROMETER



RECORD

	10 A.M	2 P.M.
MONDAY		
TUESDAY		
WEDNESDAY		
THURSDAY		
FRIDAY		

GRAPH



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MUGGY DAYS

I. **Topic Area**

Meteorology (Humidity)

II. **Introductory Statement**

Students will learn to read a wet bulb and dry bulb thermometer and use that information to compute the humidity for the day.

III. **Math Skills**

Measuring
Computation
Graphing

Science Skills

Gathering and recording data
Reading a table

IV. **Materials**

indoor thermometer
outdoor thermometer
box
shoe string
small jar

V. **Key Question**

Why do some days feel hotter than other days when the temperature is the same?

VI. **Background Information**

The amount of moisture in the air is measured by an hygrometer. The amount of moisture that air can hold varies with the temperature. The amount of moisture in the air compared to what the air can hold at that temperature is called relative humidity. Humidity is expressed in percent. High humidity (lots of moisture in the air) is expressed with a high percentage. High humidity feels hot and uncomfortable because moisture is not able to evaporate from the body as effectively. Evaporation is one of the body's methods of regulating temperature.

VII. **Management**

This is an on-going activity which can be used by itself or in conjunction with other weather lessons presented in this book. It is suggested that the class be divided into weather forecasting groups with students taking turns collecting the data. This lesson calls for one humidity reading per day. You should allow for a 5 to 10 minute period at the end of the day for computation, recording and sharing of the day's weather data.

VIII. **Procedure**

1. Help students to construct several humidity stations. See worksheet.
2. Have the humidity station set up in advance.
3. Demonstrate to the class how to take the wet bulb and dry bulb readings.
4. Show students where to record their information for computation.
5. Demonstrate how to read the table to obtain the percentage.
6. Ask the key question.
7. Divide the class into weather groups and assign a part of each group to be responsible for taking the humidity readings. Students should switch jobs each week to allow everyone to have experience with all facets of weather measurement.

IX. **What the Students Will Do**

1. Students will take a dry bulb and a wet bulb reading and record the information on the student worksheet.
2. Students will do the subtraction as indicated.
3. Students will use their difference figure to find the humidity on the chart.
4. Students will record and graph the humidity for the day.

X. **Discussion**

1. How does moisture in the air affect how we feel on a hot day?
2. When does humidity become uncomfortable on a hot day?

XI. **Extension**

1. Check the newspaper for the weather map of your area and compare your data with the official forecast for the area.
2. The WEATHER REPORT AND FORECASTING page is designed to be used to tie all of the information from the weather stations together on a daily basis. Students simply record their findings for each investigation in one column and then note the meaning of the data in the next. Students can then use this information to predict what the weather will be for the next day. With practice in interpreting this data students should find that they can become quite proficient at weather forecasting.

XII. **Curriculum Coordinates**

1. Study Indian sweat houses and Swedish saunas.
2. The rate of evaporation is important in your body's effort to cool itself down. On a humid day moisture is not able to evaporate as quickly from the body since the air is already saturated with moisture. A good illustration of this is a simple experiment using water and rubbing alcohol, two liquids with different rates of evaporation. Put rubbing alcohol on one hand and water on the other. Which cools the quickest?

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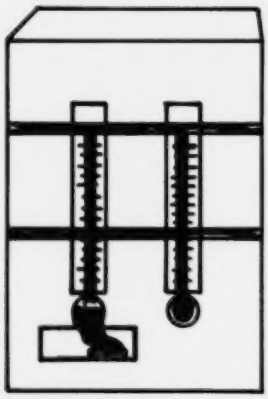
NAME _____

MUGGY DAYS



1. USE A FAIRLY SQUARE BOX AND CUT A HOLE ABOUT 4 CM FROM THE BOTTOM. PLACE A SMALL JAR OF WATER IN THE BOX.
2. USE TWO RUBBER BANDS TO STRAP TWO INDOOR / OUTDOOR THERMOMETERS TO THE BOX. MAKE SURE THE BULBS ARE EXPOSED.
3. SLIP ONE END OF A SECTION OF SHOESTRING OVER ONE THERMOMETER BULB AND THE OTHER END INTO THE JAR OF WATER.

HYGROMETER

RELATIVE HUMIDITY

THE AMOUNT OF MOISTURE IN THE AIR COMPARED TO WHAT THE AIR AT THAT TEMPERATURE COULD HOLD.

	MON	TUES	WED	THURS.	FRI.	
						DRY BULB READING
−						WET BULB READING
						DIFFERENCE
	%	%	%	%	%	RELATIVE HUMIDITY

USE THE DRY BULB READING AND THE DIFFERENCE TO FIND THE RELATIVE HUMIDITY ON THE CHART.

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RELATIVE HUMIDITY CHART

DRY BULB, °C

DIFFERENCE BETWEEN DRY BULB AND WET BULB, °C	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	87	87	88	88	89	89	90	90	91	91	91	91	91	92	92	92	93	93	93	93
2	73	74	75	76	77	78	79	79	80	80	81	82	82	83	83	83	84	84	85	85
3	59	61	63	64	65	67	68	69	70	71	72	72	73	74	75	75	76	77	77	78
4	46	49	51	52	54	56	57	59	60	61	62	64	65	66	66	67	68	69	70	70
5	34	36	39	41	43	45	47	49	51	52	54	55	56	58	59	60	61	62	63	63
6	21	24	27	30	33	35	37	40	42	43	45	47	48	50	51	52	53	54	55	56
7	8	12	16	20	23	25	28	30	33	35	36	39	41	42	44	45	47	48	49	50
8				9	13	15	18	21	24	27	28	31	33	35	37	38	40	41	43	44
9						7	10	13	16	19	21	24	26	28	30	32	33	35	36	38
10									8	11	14	16	19	21	23	25	27	29	31	32
11											7	9	12	15	17	19	21	23	25	27
12														8	11	13	15	18	20	21

- FIND DRY BULB TEMPERATURE READING ALONG TOP OF CHART
- FIND THE DIFFERENCE BETWEEN THE DRY AND WET BULB TEMPERATURES ALONG THE COLUMN AT THE FAR LEFT.
- FIND THE INTERSECTION OF THOSE TWO READINGS AND RECORD % OF HUMIDITY. EXAMPLE: 13°C DRY BULB WITH A DIFFERENCE BETWEEN WET AND DRY READINGS OF 5° WOULD INDICATE A 51% HUMIDITY.

Potato "Eye"-deas

I. **Topic Area**

Plants—Potatoes

II. **Introductory Statement**

Students will become better acquainted with potatoes...their likenesses and differences.

III. **Math Skills**

Estimating
Measuring
Graphing

Science Processes

Observing and Classifiying
Gathering/Recording Data
Interpreting Data

IV. **Materials**

For each group of 5-6 students:
a small bag of potatoes (one per person)
balance and masses
meter tapes

V. **Key Question**

Are all potatoes created equally?

VII. **Management Suggestions**

1. Distribute a small sack of potatoes to each group. Estimate the number of potatoes in each sack. Count and record.
2. Each student should select a potato and describe it.
3. Estimate the number of eyes you think your potato has. Count and record the number of eyes. Figure out the average number of eyes on a potato in your group's sack of potatoes. Compare with total class.
4. Weigh each of the potatoes in the sack. Do any two weigh the same?
5. Measure and record the length of each potato. What is the range of lengths.
6. Measure and record the circumference of all the potatoes.
7. Take a survey within your small group to determine the preferred way to eat potatoes— mashed, baked, or fried. Make a graph.
8. Combine the results of each group to graph the results for all the students in the class.

X. **Discussion**

1. Discuss the likenesses and differences of potatoes.
2. What is the average number of eyes on a potato?
3. What is the average weight (mass) of a potato?

XI. **Extensions**

1. Explore the idea of how many French fries can be made from one potato.
2. How many potatoes come in a 5 lb. bag? A 10 lb. bag?
3. Compare potatoes that are labeled grade #1 or #2.
4. Share potato recipes.
5. Research the nutrient value of the potato.

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Name _____

Potato "Eye"-deas

A. Look at your sack of potatoes.
How many potatoes do you think it has?...Guess:_____
Count how many potatoes in the sack.....Count:_____
How far off was your guess?.....Error:_____

B. Number each potato with a marker. Pick one out for yourself.

Make a sketch of your potato:	Describe your potato:

C. How many eyes do you think your potato has?...Guess:_____
Count how many eyes your potato has.....Count:_____

What is the arerage number of eyes on a potato in your group's sack of potatoes?

Average # eyes:_____

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Potato "Eye"-deas

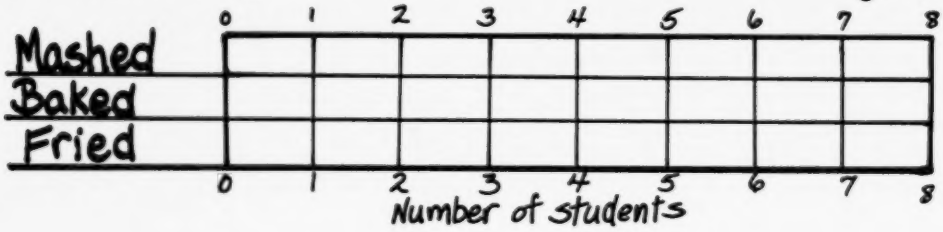
D. Try to find 2 potatoes in your group's sack that weigh the same. Weigh them both and record below:

Potato #_____ Potato #_____

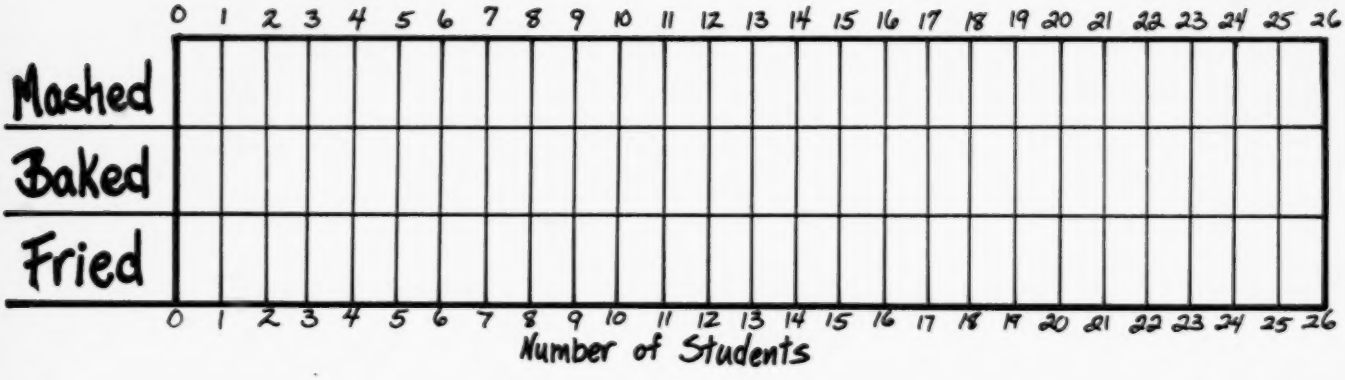
Find the longest potato. How long is it?... Length:_____

Find the fattest potato. Measure its circumference. How big around is it?..... Circumference:_____

E. Take a survey. How do the students in your group like to eat potatoes? Do they prefer their potatoes mashed, baked, or fried? Make a graph:



F. Take another survey. How do the students in your class like to eat potatoes? Make a graph. How does this graph compare with your group's graph?



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Potato Planting

You will need:

- Potato
- Knife
- Dirt
- Potting soil
- Large can
- Bottle opener
- Pie pan
- Water

1. Mix the garden dirt with the potting soil so that you have a mixture of ½ dirt and ½ potting soil.

2. Put a layer of small stones or gravel in the bottom of the large can. Fill can ⅔ full of soil mixture.

3. Cut your potato into 4 pieces. 3 of the pieces must have eyes, or buds, on them. One piece should have no eyes or buds.

4. Plant your 4 potato pieces in the can. Cover with more soil then add water.

5. Use a bottle opener to punch 4 holes in the bottom of the can for drainage.

6. Put a pie pan underneath the can to catch drainage. Place in a sunny area. Water when needed.

7. When a stem has grown at least 2 inches in height, uncover the potato pieces.

8. Draw diagrams of the plants' development.

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More Potato "Eye"-deas

Cut out a large potato pattern from light brown butcher paper. Brainstorm with the class all the things that are made from potatoes. List on potato. Display.

Have students research the potato and its role in the history of Ireland. Write facts on a giant brown paper bag potato. Stuff and hang over your potato activities.

=Potato Story Starters=

stick story starters into potato with toothpicks.

=Potato Stamps=

Cut your own stamp for potato prints. Dip stamp into paint and print designs.

Hot Potato

Children sit in a circle. When the music starts, they pass the potato around the circle. The person holding the "hot potato" when the music stops is out.

Potato Relay

Relay teams must carry and pass the potato with a spoon.

Decorate or disguise your potato.

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BUG RACES

I. **Topic Area**

Speed of insects

II. **Introductory Statement**

Students will discover that insects move at a great speed relative to their size.

III. **Math Skills**

Measurement
Whole number computation (multiplication & division)
Formula equation
Calculator use (optional)

Science Processes

Observing
Comparing

IV. **Materials**

1 insect
chalk
tape measure (one used for track is best)
string
stopwatch

V. **Key Question**

Can you run faster than this insect?

VI. **Background Information**

Catch an insect that doesn't sting, bite, or fly. A stinkbug works well—it is big enough to measure and they walk quickly.

VII. **Management**

Day 1:

1. Measure the distance the bug travels in 10 seconds. Measure the distance 1 student travels in 10 seconds. Figure their body lengths traveled. Approximately 35 minutes.

Day 2:

1. Complete student worksheet and discuss comparisons. Approximately 35-40 minutes.

Day 3:

1. Compare distances on the track or playground. Approximately 45-50 minutes.

1. The bug will probably not run in a straight line. To measure distance traveled, whenever the bug changes directions, use the chalk and mark an X on the spot where he turned. Then draw a small arrow pointing to his new direction. After he has walked or run for 10 seconds, use a piece of string to measure from X to X. Cut and measure the string.
2. If the bug doesn't want to move, have 1 student pat his hand behind the bug to keep him moving.
3. Math skills in this investigation may be advanced for some classes. Adapt to the level of your students.

VIII. **Procedure**

1. Measure bug.
2. Measure student.
3. Release bug and follow his path for 10 seconds.
4. Measure the distance the bug traveled in cm.
5. Student will run in a straight path for 10 seconds.
6. Measure distance student traveled in cm.
7. Record results in this way:
   A = bug size = _____
   B = bug distance traveled = _____
   C = bug body lengths traveled = _____
   D = student size = _____
   E = student distance traveled = _____
   F = student body lengths traveled = _____
8. Formulas are: $B \div A = C$
   $E \div D = F$

   EXAMPLE:
   A = bug size = 3 cm
   B = bug distance traveled = 300 cm
   C = bug body lengths traveled = 100
   D = student size = 150 cm
   E = student distance traveled = 5000 cm
   F = student body lengths traveled = 33
9. How far would the bug travel if it were the same size as the student? Use this formula $C \times D =$ distance traveled by bug.

   EXAMPLE:
   $C \times D = 100 \times 150$ cm = 15000 cm

   Remind the students that this means the bug could travel 15000 cm in 10 seconds!
10. After finding how far the bug would travel if it was the size of the student, measure that distance on the track or on your playground.
11. Have students run the measured distance and time how long it takes them.

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IX. **What the Students Will Do**

1. Students will observe the bug running.
2. Two students will measure the distance the bug ran.
3. One student will run for 10 seconds.
4. Two students will measure distance the student ran.
5. All students will compute the body lengths that the bug and student traveled.
6. Students will compute the distance bug would travel if it were the same size as the student.
7. Students will measure the distance (on a track) the bug would travel if it were the same size as the student.
8. One student will run the distance.

X. **Discussion**

1. Did the bug travel in a straight line? If it didn't, do you think there was a reason? (Perhaps it is a defense against predators—it may be harder to catch him if he keeps darting back and forth).
2. Do you think bugs get tired of running like we do?
3. Why does a bug need to move quickly?

XI. **Curriculum Coordinates**

1. ***Science:*** Study insect defenses.
2. ***Language Arts:*** Write a story about an insect being chased by a predator.

XII. **Extensions**

1. Compare different insects' speeds to each other.

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NAME_____

BUG RACES

A = BUG SIZE

B = BUG DISTANCE TRAVELLED

C = BUG BODY LENGTHS TRAVELLED

D = STUDENT SIZE

E = STUDENT DISTANCE TRAVELLED

F = STUDENT BODY LENGTHS TRAVELLED

RECORD

A = _____

B = _____ ⟶ B ÷ A = _____

BUG BODY LENGTHS TRAVELLED = C

D = _____

E = _____ ⟶ E ÷ D = _____

STUDENT BODY LENGTHS TRAVELLED = F

D = _____ X C = _____ = _____ *

* THIS IS HOW FAR THE BUG WOULD BE ABLE TO TRAVEL IN 10 SECONDS IF IT WERE THE SAME SIZE AS THE STUDENT.

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CARTOON CRITTERS

I. **Topic Area**
Animals

II. **Introductory Statement**
Students will learn the main types of animals, and the difference between wild and domestic animals.

III. **Math Skills**
Whole number computation
Graphs
Interpreting data

Science Processes
Observing/classifying
Gathering/recording data

IV. **Materials**
cartoon pages from newspapers
or
comic books
or
television cartoons

V. **Key Question**
What types of animals are found in cartoons? Are they wild or tame animals?

VI. **Background Information**
1. An animal should be considered "wild" if most of the animals of that type are wild. An animal should be considered "tame" if most of the animals of that type are tame.
2. These are the general characteristics of the types of animals given:
mammal—fur or hair, gives birth to live young, feeds young on mother's milk
bird—feathers, lays eggs on land that have hard shells
reptile—scaly skin, lays eggs on land that have leathery shells
amphibian—moist skin, lays eggs in water in large quantities
fish—gills, fins, lays eggs in water in large quantities
insect—six legs, segmented body
other—molluscs, arachnids, etc.

VII. **Management**
This activity may take 3 to 5 days to collect the information if using television, or the whole activity may be completed in 60 to 90 minutes if using newspaper cartoon pages and comic books that are made available in the classroom.

VIII. **Procedure**
1. Students are to work individually on this investigation.
2. The teacher will provide one worksheet for each child.
3. The class will be familiar with the classifications of types of animals from previous work or the teacher will introduce this activity with a class discussion of the types of animals. It is suggested that the types and examples of each type be on display during this activity.
4. If using television cartoons, students will complete the data sheet at home and the teacher will continue the activity in class.
5. If using paper cartoons, the teacher should provide enough cartoons so that each child has one to work on, with extras just in case there are few animals in that issue.
6. The teacher should discuss the difference between "wild" and "tame".
7. The teacher should let the children work as independently as possible on the data sheet, but should give full-class instructions on completing the second page of the worksheets.

IX. **What the Students Will Do**
1. Students will gather data on cartoon animals.
2. Students will total the number of "wild" and "tame" animals.
3. Students will total the number of "mammals", "birds", etc.
4. Students will graph the results.
5. Students will complete the student worksheets.

X. **Discussion**
1. Why are there so many animals in cartoons?
2. How do the animals act?
3. Do they act like real animals would?
4. What is good about having animals in cartoons?
5. What is bad about having animals in cartoons?

XI. **Extensions**
1. Calculate and graph the different kinds of animals, i.e. "dog", "cat", etc.

XII. **Curriculum Coordinates**
Language Arts—Write a story/play/poem about the meeting between a real wild animal and its cartoon counterpart.
Music—Learn any one of the countless songs about animals.
Physical Education—Play any tag game, as they are basically "predator and prey" activities.
Social Studies—Research the distribution of different animals around the world.
Art—Cut out pictures of the real animals and the cartoon equivalents and glue them in pairs on construction paper. Label the differences/similarities.
Project WILD—This is a relevant collection of activities for conservation and environment education.

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CARTOON CRITTERS

CARTOON / NAME OF ANIMAL	TYPE OF ANIMAL (MAMMALS, BIRDS, ETC.)	WILD	TAME
	TOTAL		

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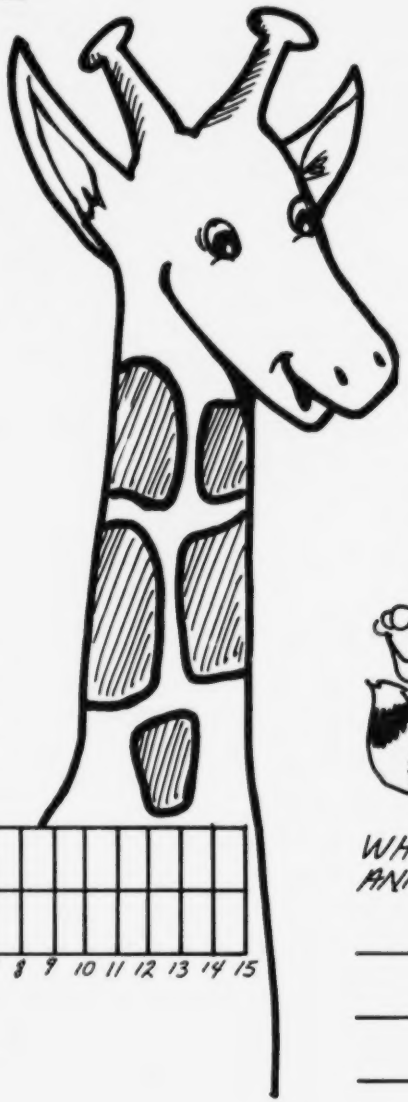
NAME _____

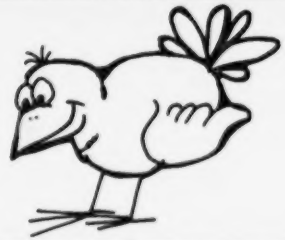
TYPE OF ANIMAL	TOTAL #
MAMMAL	
BIRD	
REPTILE	
AMPHIBIAN	
FISH	
INSECT	
OTHER	



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
WILD																
TAME																

TOTAL #

TOTAL #



	MAMMAL	BIRD	REPTILE	AMPHIBIAN	FISH	INSECT	OTHER
11							
10							
9							
8							
7							
6							
5							
4							
3							
2							
1							
0							

WHY DO YOU THINK THERE ARE SO MANY ANIMALS IN CARTOONS?

_____

_____

_____

_____

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COLOR ME SAFE

I. **Topic Area**

Survival according to coloring

II. **Introductory Statement**

Students will discover the importance of an animal or insect's coloring in relation to its survival.

III. **Math Skills**

Whole number computation

Science Processes

Gathering/recording data
Interpreting data
Applying/generalizing

IV. **Materials**

500 toothpicks—200 green, 200 brown, 100 yellow
brightly colored string or yarn
stopwatch
student record sheet

V. **Key Question**

What color is best suited for survival in an area of vegetation? What color is best suited for a desert area?

VI. **Background Information**

This investigation deals with three colors and how well they are camouflaged in nature.

Green toothpicks will usually be easier to find than brown toothpicks. Brown is a better camouflage color.

Yellow is usually a warning color (bees, wasps...) or a signal to attract (flowers), so those toothpicks will stand out in both areas.

Students should be aware of the meaning of adaptations in living things—special characteristics which help living things stay alive in their environment.

VII. **Management**

1. This investigation will take 45-60 minutes—15 minutes for explanation, 15 minutes for hunting, and 30 minutes for students to complete the worksheet.
2. Before starting the investigation, rope off an area of grass with your string or yarn. This area should be approximately 7 M×7 M. Rope off the same sized area of dirt.
3. To color toothpicks—use an 8 oz. plastic cup and fill half of it with green paint. Drop toothpicks in and swish them around so that all toothpicks are painted. Take toothpicks out and spread out on waxed paper to dry. Do the same to color toothpicks brown and yellow. Different shades of green and brown may be used. This should be done 1 or 2 days before the investigation to give toothpicks a chance to dry thoroughly.
4. Randomly distribute 100 green, 100 brown, and 50 yellow toothpicks in the grass area. Distribute the same amount of toothpicks in the dirt area.
5. Divide students into 2 groups—Grass Predators and Dirt Predators.
6. Students should choose a partner from their own group or be assigned a partner by the teacher.

VIII. **Procedure**

1. Students will look for toothpicks in their assigned areas.
2. Each pair of predator partners will "hunt" for 30 seconds. Repeat this procedure until all partners have had a chance to hunt.
3. All hunting will take about 15 minutes for total group depending on your class size.
4. Immediately after hunting, predator partners will count the number of green toothpicks found, the number of brown toothpicks found, and the number of yellow toothpicks found.
5. Partners will take turns announcing results, so that the rest of the class may record results on their charts.
6. Students will complete worksheet using information from their chart.

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IX. **Discussion**

1. What color was easiest to find? (yellow) Why? (Because it is so bright)
2. What color is the best for survival? (brown) Why? (Because it camouflages well in both grass area and dirt area)
3. Name some insects and animals that are brown. Name some that are green. Can you think of more green animals or more brown animals (insects included)?
4. Why would it be good to be colored brown if you were a predator? (So you could sneak up on your prey unnoticed)

X. **Extensions**

1. Collect insects and keep a record of the area they were found. Was it camouflaged or not? What color is it? Classify according to color. Is there a color that is most common?
2. Distribute an unknown number of toothpicks (same colors) in an area 7 M × 7 M. Have them hunt on a small part of the total area. Students will then figure how many toothpicks were distributed. Example: If students hunt in an area that is 1 M × 1 M, then they will multiply their findings by 7.

XI. **Curriculum Coordinates**

1. ***Social Studies:*** Forest regions and desert regions
2. ***Art:*** give students a picture of an animal and have the students camouflage the background.
3. ***Science:*** study insects and their adaptations. Study plant adaptations.
4. Language: students will write a story about an insect that is hiding from a predator.

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COLOR ME SAFE

YOUR NAME _____

PARTNER'S NAME _____

AREA YOU WILL HUNT → GRASS OR DIRT

YOU AND YOUR PARTNER WILL HUNT (CIRCLE ONE)

1ST 2ND 3RD 4TH 5TH 6TH 7TH

HOW MANY DID YOU FIND?

GREEN	BROWN	YELLOW
_____	_____	_____

PREDATOR ↓

	GRASS			DIRT		
	GREEN	BROWN	YELLOW	GREEN	BROWN	YELLOW
1ST						
2ND						
3RD						
4TH						
5TH						
6TH						
7TH						
TOTAL						

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NAME _____

1. HOW MANY GREEN TOOTHPICKS ARE LEFT IN THE GRASS AREA? ____

2. HOW MANY BROWN TOOTHPICKS ARE LEFT IN THE GRASS AREA? ____

3. HOW MANY YELLOW TOOTHPICKS ARE LEFT IN THE GRASS AREA? ____

4. HOW MANY GREEN TOOTHPICKS ARE LEFT IN THE DIRT AREA? ____

5. HOW MANY BROWN TOOTHPICKS ARE LEFT IN THE DIRT AREA? ____

6. HOW MANY YELLOW TOOTHPICKS ARE LEFT IN THE DIRT AREA? ____

7. IN THE GRASS AREA, WERE MORE GREEN TOOTHPICKS OR MORE BROWN TOOTHPICKS FOUND?

_____

HOW MANY MORE? _____

8. IN THE DIRT AREA, WERE MORE GREEN TOOTHPICKS OR MORE BROWN TOOTHPICKS FOUND?

_____

HOW MANY MORE? _____

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BITTER LITTER

I. **Topic Area**

Litter and ground pollution

II. **Introductory Statement**

Students will learn how the environment affects different types of litter.

III. **Math Skills**

Counting
Graphing
Estimating

Science Processes

Observing/classifying
Gathering/recording data
Interpreting data

IV. **Materials**

various samples of litter
hammer
soil
candle
matches

V. **Key Question**

What happens to litter when left on the ground for a period of time?

VI. **Background Information**

Select an area ahead of time where it will be safe for students to gather litter. The school playground might be a good place to start. Students may wish to bring a brown lunch bag in which to collect litter.

You may wish to discuss kinds of litter that may require supervision in collecting such as broken glass.

VII. **Management**

The initial collecting and sorting of litter samples and the graphing activity may take a 50 minute class period.

Several short class sessions to observe and record effects of a simulated environment on litter samples will be needed.

VIII. **Procedure**

1. Arrange for a walking tour of area surrounding school to collect litter.
2. Discuss with students some awareness kinds of questions:
   a. Look at a picture of a beauty spot ruined by litter. How does this sort of thing happen?
   b. In what kind of environment do you think the most litter would be found?
   c. Who contributes to the accumulation of litter? (Make a list of litter droppers).
   d. What kinds of litter do people discard?
   e. Discuss the idea that people, not animals, litter.
3. Accompany students to selected area for litter collection.
4. Sort, count and record the types of litter collected.
5. Make a bar graph to display data collected.
6. Make a class graph to display data collected.
7. Perform some tests on various samples of litter that might simulate how the environment affects each kind. Some suggested techniques include: soaking litter in water to represent a wet night, beating with a hammer to represent crushing by trampling, burying to represent a land fill. Other ideas may also be included.
8. Conclude with a class discussion of the results.

IX. **What the Students Will Do**

1. Gather litter
2. Sort and record number and kinds of litter.
3. Make a bar graph showing number and kinds of litter.
4. Make a class graph of the total number and kinds of litter collected.
5. Perform simulated tests on litter samples.

X. **Discussion**

1. What kinds of litter are the biggest nuisance to the environment?
2. What kinds of litter are not harmful to the environment?
3. Are there any types of litter that might benefit the environment? What are they and how could they be beneficial?
4. Discuss the term bio-degradeable. What kinds of litter fall into that category?
5. Which test was most effective in deteriorating the litter?
6. What might be some satisfactory ways of disposing of litter?

XI. **Extensions**

1. Investigate the arrangements your town has made for litter control.
2. Keep a record for a week of what happens to the "throw aways" in your own home.
3. Estimate the time for a piece of litter to naturally decay in a land fill. Bury samples and keep a record.

XII. **Curriculum Coordinates**

1. Write a story or poem about the life of a piece of litter.
2. Construct a collage or sculpture of various types of litter.

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NAME _____

BITTER LITTER

LITTER ESTIMATE	
KINDS	NUMBER

BAR GRAPH OF LITTER ACTUALLY FOUND																								
KINDS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

NAME _____

BITTER LITTER

WHAT HAPPENS TO LITTER AFTER IT'S BEEN DROPPED? BRING IN SOME SAMPLES AND TEST THEM!

MATERIALS → / PROCEDURE USED WITH MATERIAL ↓													
SOAK IN WATER FOR TWELVE HOURS (REPRESENTS A WET NIGHT)													
LEAVE OUT OF DOORS FOR THREE WEEKS.													
BEAT WITH A HAMMER (REPRESENTS CRUSHING BY TRAMPLING)													
LEAVE IN LOW TEMPERATURE FOR 12 HOURS (REPRESENTS A COLD NIGHT)													
BURY IN SOIL FOR ONE MONTH (REPRESENTS A LAND FILL)													

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POLLUTION SOLUTION

I. **Topic Area**
Air pollution

II. **Introductory Statement**
The students will observe and identify pollutants in the air.

III. **Math Skills**
Estimating
Graphing

Science Processes
Collecting/recording data
Interpreting data
Observing/classifying

IV. **Materials**
clear "contact" paper
thumb tacks
thick cardboard or small blocks of wood
wax paper or Saran Wrap
Vaseline
magnifying glasses

V. **Key Question**
What was in the air that you breathed on your way to school today?

VI. **Background Information**
Have some places in mind within walking distance of the school where the air-dirt collectors can be placed. It is suggested that one is placed near streets with a lot of traffic, another in a wooded or pastoral setting, and some indoors at home and school.

VII. **Management**
1. A class period of 30 minutes to choose working groups, make the collectors, and decide where to put them.
2. An additional 30 minute period to place the collectors in various spots where they will not be disturbed for three days.
3. After three days a 50 minute class period to collect and examine the collectors.

VIII. **Procedure**
1. Gather materials (students may bring some in).
2. Select locations for collectors.

IX. **What the Students Will Do**
1. Choose a group of six kids to work with.
2. Each child in group makes an air-dirt collector. There are two different kinds that can be made:
   Contact paper collector—Get clear contact paper and cut it into 10 cm squares. Carefully peel off the backing and thumb tack each square to a thick piece of cardboard, or a small block of wood keeping the sticky side out.
   Wax paper collector—Cut wax paper or Saran Wrap into 10 cm squares. Thumb tack it to heavy pieces of cardboard or small blocks of wood. Rub a *small* amount of Vaseline over the surface using just enough to make it sticky. The paper should look pretty clear when you are done.
3. Decide where the collectors are going to be placed and place them. Suggestions for placement were given in Background Information. They will be left for three days.
4. Collect the "collectors" marking each one so you know where it had been placed.
5. Estimate the number of dirt particles on each one.
6. Examine collector with a magnifying glass or hand lens and try to identify the different particles.
7. Complete the student worksheets.

X. **Discussion**
1. What kinds of particles were on the collectors?
2. Which collector had the most? least?
3. Which one had the cleanest air for breathing? Why?
4. Which areas should be avoided?
5. What do you think can be done to make the air cleaner?
6. Were there some particles that would be unsafe to breathe?
7. Were there some particles that shouldn't bother our breathing? What were they?

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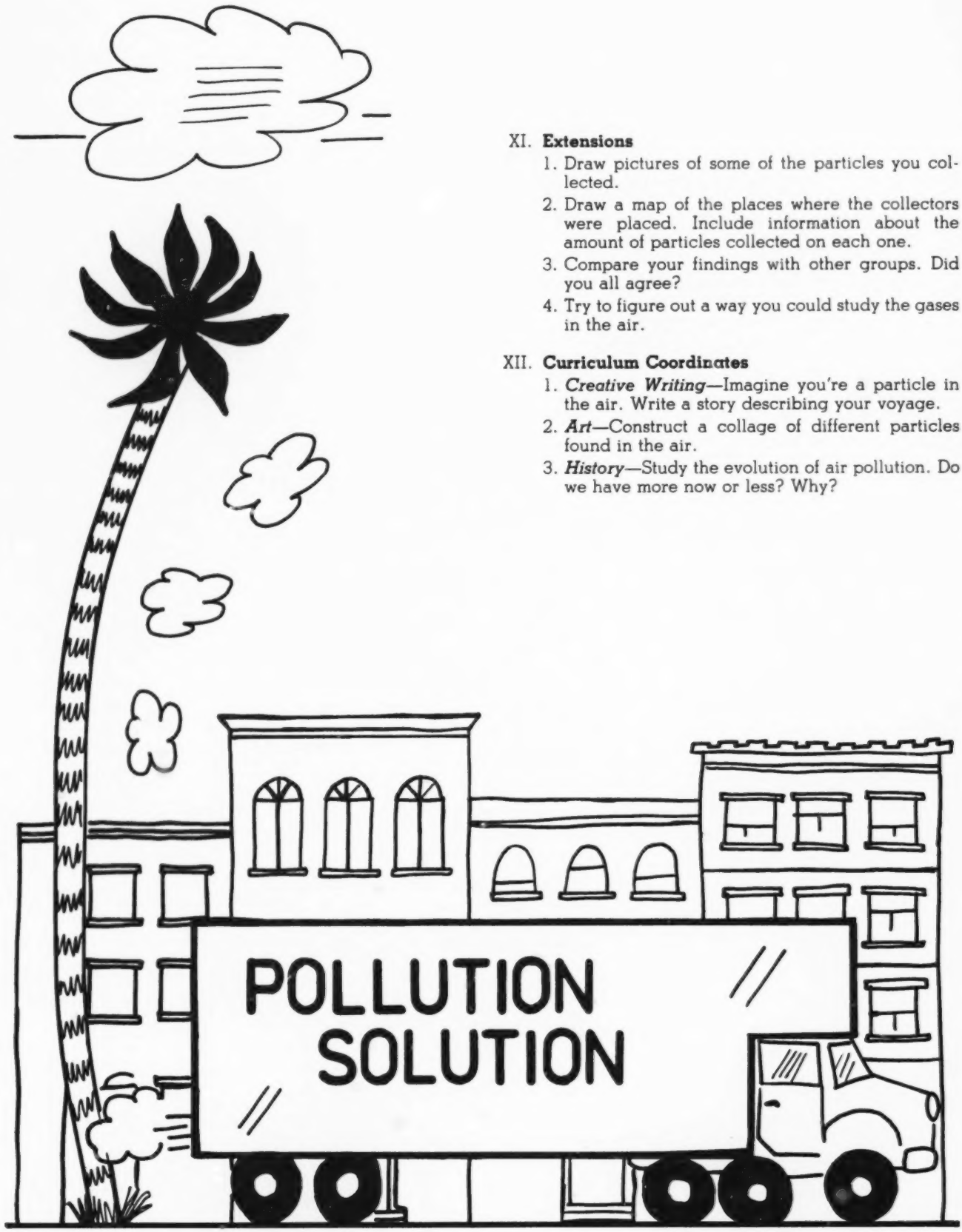

XI. **Extensions**

1. Draw pictures of some of the particles you collected.
2. Draw a map of the places where the collectors were placed. Include information about the amount of particles collected on each one.
3. Compare your findings with other groups. Did you all agree?
4. Try to figure out a way you could study the gases in the air.

XII. **Curriculum Coordinates**

1. ***Creative Writing***—Imagine you're a particle in the air. Write a story describing your voyage.
2. ***Art***—Construct a collage of different particles found in the air.
3. ***History***—Study the evolution of air pollution. Do we have more now or less? Why?

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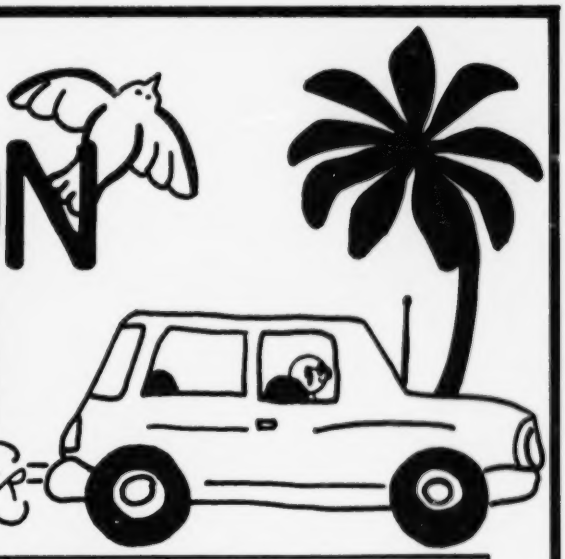
NAME _____

POLLUTION SOLUTION



WHAT DO YOU THINK IS IN THE AIR YOU BREATHE EVERYDAY?

SETTING FOR COLLECTOR	KIND OF COLLECTOR USED	ESTIMATE OF PARTICLES	KIND OF PARTICLES
AREA WITH TRAFFIC			
PASTORAL SETTING			
INDOORS AT SCHOOL			
INDOORS AT HOME			

1. WHICH COLLECTOR HAD THE MOST PARTICLES? _____

   THE LEAST PARTICLES? _____

2. WHICH AREA HAD THE CLEANEST FOR BREATHING?

   _____

3. WHICH AREAS SHOULD BE AVOIDED? _____

   _____

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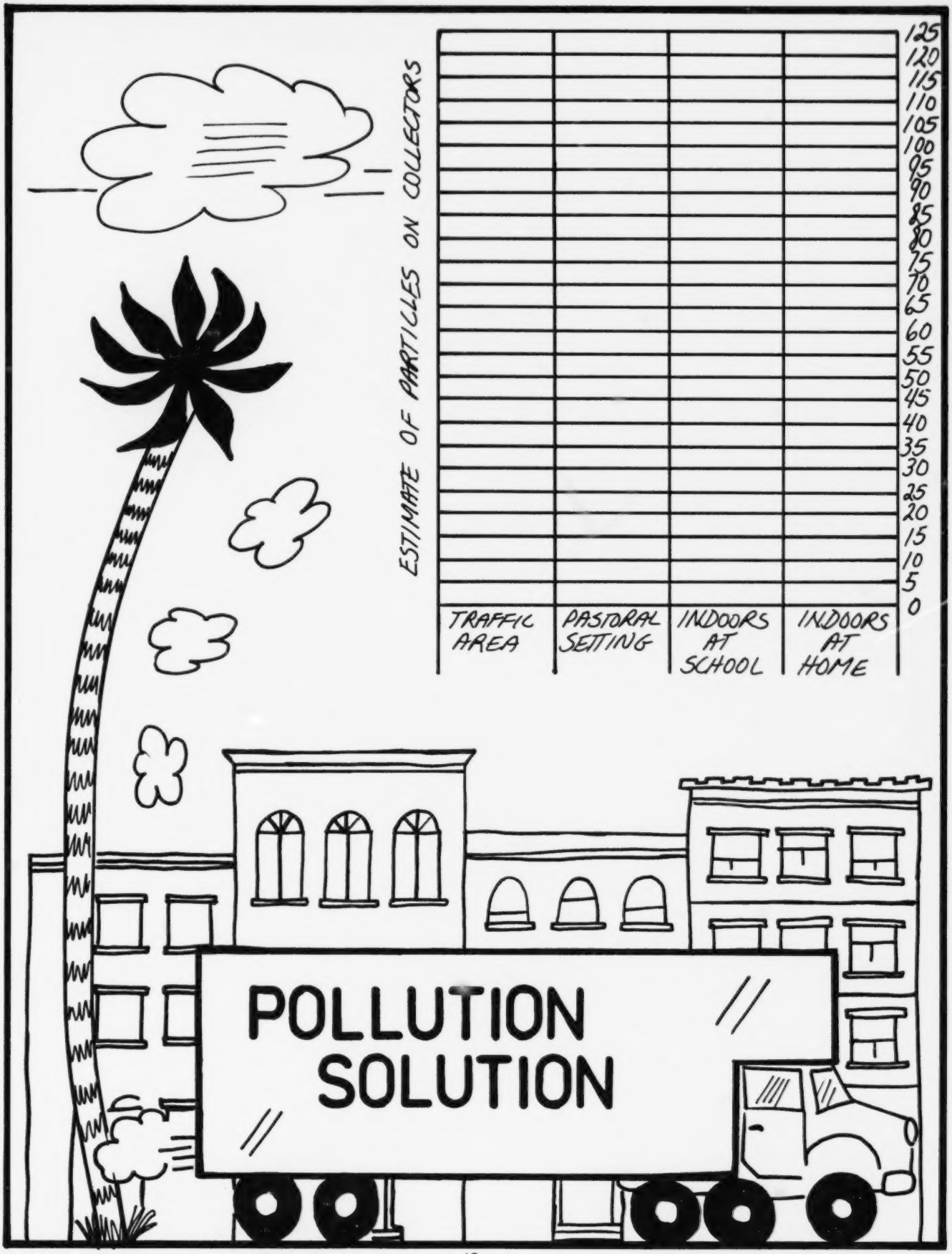

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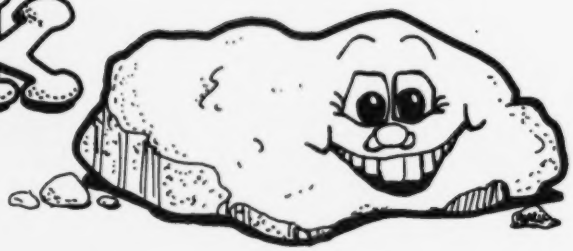
Pet Rock



I. **Topic Area**

Geology—rocks

II. **Introductory Statement**

Students will become familiar with some of the characteristics of rocks.

III. **Math Skills**

Measuring
Estimating
Attributes
Venn Diagram

Science Processes

Observing
Predicting
Gathering/recording data
Classifying

IV. **Materials**

Per Student:
each brings one rock

For Class:
two or more metric rulers
two or more scales with gram weights
two or more copper pennies
two or more steel nails
water container
100 ml or less of vinegar
eyedropper
yarn for Venn Diagrams
magnifying glasses, optional

V. **Key Question**

What characteristics make your rock unique among all the pet rocks in our class?

VI. **Background Information**

Rocks and Minerals

There are over 2,000 minerals in the earth, but ten form 99% of the earth's rocks. Geologists measure the hardness of minerals by giving them a number from one (soft) to ten (hard).

How are rocks and minerals different? Minerals are relatively pure and chemical formulas can be written for them. Rocks are usually a mixture of minerals. Some minerals, but not all, form rocks. Some of these rock-forming minerals are listed below.

Mohs' Scale of Hardness of Minerals

Hardness	*Example*	*Scratch Test*
1	talc (talcum powder)	fingernail scratches
2	gypsum (chalk, plaster of paris)	fingernail scratches
3	calcite (limestone)	copper penny scratches
4	fluorite	knife scratches
5	apatite	knife scratches
6	feldspar (granite)	metal file scratches
7	quartz (amethyst, agate, onyx)	scratches glass
8	topaz	scratches quartz
9	ruby, sapphire	scratches topaz
10	diamond	scratches others, only scratched by diamond

Hardness of common materials: fingernail—2.5; copper penny—3.0; steel knife—5.5-6.5

Kinds of Rock

Sedimentary—The word comes from Latin and means "settle". Sediment such as sand, clay, and gravel can be cemented together by water pressure, forming sandstone, shale, and conglomerates respectively. Sedimentary rock is also formed from living things such as plants (coal). A third formation is caused by chemical change (many forms of limestone). Fossils are common in sedimentary rock, particularly near the ocean.

Igneous—This group of rocks is formed from hot, liquid magma. Coarse-grained rocks such as granite are produced by slowly cooling underground. The Sierra Nevadas are granite. Others such as basalt, obsidian, and pumice cool quickly on the surface.

Metamorphic—Rock that changes from its original form due to pressure, heat, gas, or water is called metamorphic. Crystals may grow, bands of minerals may form, layering may develop, etc. Slate can develop from shale and marble from limestone.

VII. **Management**

1. Ask each student to bring a rock bigger than their thumb and smaller than their fist. Encourage them to bring interesting and unusual specimens, perhaps collected on a vacation.
2. If possible, bring in samples of soft rocks, lava, and pumice for comparison.
3. Set up the following comparisons:
   Length—metric rulers
   Mass—scales and weights
   Scratch—copper pennies, nails
   Vinegar—vinegar, eyedropper, paper towel
   Float—water in container, paper towel
4. The top half of the worksheet will be done individually. After making predictions, student groups of four to five will move from center to center performing tests; some may need to wait until a center is available.
5. ***Day 1:*** Allow about 60 minutes to make predictions, gather data, and write descriptions.
   Day 2: Allow 45-60 minutes for guessing game and Venn Diagrams.

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VIII. **Procedure**

1. Decide if students should round to the nearest cm or nearest half cm when measuring length.
2. Before handing out the worksheet, have students study their rocks and write down at least five observations. Optional—use magnifying glasses.
3. Scratch Test: A scratch is defined as a small crevice. Presure should be applied. Traces of metal left on a rock are not scratches. Try the scratch test in this order: fingernail, penny, nail. See Background Information to relate to the scale of hardness.
4. Vinegar Test: Use an eyedropper to place a few drops of vinegar in a scratch or on the surface. If it bubbles, calcium carbonate found in limestone, marble, etc. is present.
5. Float Test: Place the rock gently in water and see if it will float. Try pumice, it will.

IX. **What the Students Will Do**

1. Bring a rock and give it a pet name
2. Record answers on top half of worksheet. Then draw a side view of the rock.
3. Estimate length (cm) and mass (g).
4. Predict which material will scratch the rock and the results of the vinegar and float tests.
5. Travel from center to center in groups, measuring length/mass and doing the scratch, vinegar, and float tests.
6. Make a list in sentence or paragraph form describing the rock's characteristics. During the guessing game, evaluate whether the statements are complete and lead to identification.
7. Play a guessing game: Gather the rocks together and collect student descriptions. Slowly read their statements and see if the rock can be identified from the pile.
8. Venn Diagram: Make two yarn circles on the floor or table. Gather the class around and have them divide rocks by color, size, or other tests. Paper strips labeled smooth/rough; more than/less than 100 grams; one color/many colors; bubbles/doesn't bubble, etc. help.

X. **Discussion**

1. Is your rock all one color? (most rocks are formed from several minerals)
2. Do you think there is any kind of rock that will float? (pumice)
3. Were the rock descriptions clear and helpful? How could we improve our writing?
4. Compare your rock with a neighbor's. In what ways are they alike? different?

XI. **Extensions**

1. Use rock identifying books along with data collected to determine whether the rock is sedimentary, igneous, or metamorphic.
2. Streak Test: Scratch the rock against an unglazed porcelain tile (back of kitchen tile). Color will help determine minerals present. Find information on mineral colors.

XII. **Curriculum Coordinates**

Language Arts

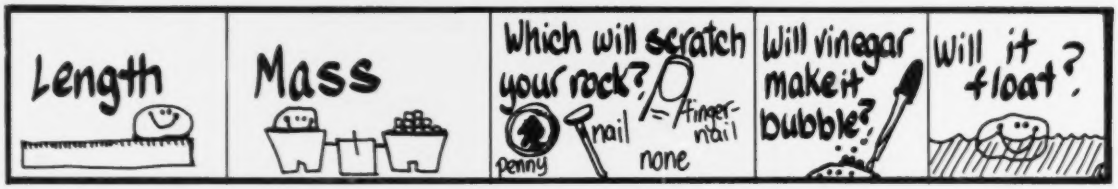
1. Write directions for taking care of your pet rock.
2. Write a cartoon or story about your rock's adventures.
3. Read *Sylvester and the Magic Pebble* by William Steig.
4. Research ways rocks are used.

Computer

1. Create a simple data base on rock characteristics.

Creative Thinking

1. Make a list of new/interesting/unusual ways to use rocks.



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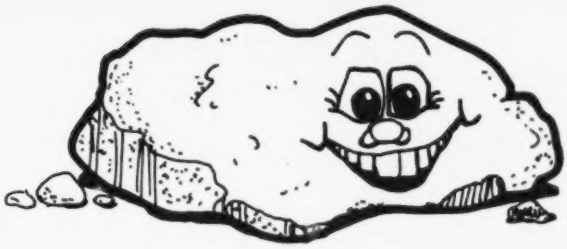

Name _____

Pet Rock

What is special about your rock?

Rock's name: _____

Where found: _____

Rough or Smooth: _____

Light or Dark: _____

Color Description: _____

_____

_____

Draw a side view of your "pet" rock.

	Length	Mass	Which will scratch your rock? penny, nail, fingernail, none	Will vinegar make it bubble?	Will it float?
Prediction					
Actual					

Use the above information to describe your rock.

_____

_____

_____

_____

_____

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WHAT MAKES SOIL?

I. **Topic Area**

Soil composition

II. **Introductory Statement**

Students will explore the components of different soil samples.

III. **Math Skills**

Measuring mass
Comparing
Estimating

Science Processes

Observing/classifying
Gathering/recording data

IV. **Materials**

Each group of 3-5 students will need:
magnifying glass or hand lens
balance scale and metric masses
3 soil samples in plastic sandwich baggies

V. **Key Question**

How are soils from different sources alike?

VI. **Background Information**

Texture is an important characteristic of soil. Soil texture refers to the size of the particles found in the sample. These particles may vary in size from large, such as gravel, to medium, such as sand, to small, such as clay. Most soils contain a mixture of these various types of particles. Sandy soil contains at least 50% sand and clay soil contains at least 50% clay.

VII. **Management**

This activity works well if class is divided into teams of 3-5 students.

Each student should be responsible for bringing a small fistful of soil in a plastic sandwich baggy. Encourage students in a single group to bring in different soil types. Students will probably not be knowledgeable in identifying soil types so it may be simpler to identify each soil sample by naming the location from which it came. For example, playground, garden, beach, river bank, park, etc.

VIII. **Procedure**

1. Place a small amount of each of three soil samples on a piece of white paper.
2. Examine carefully. Use a hand lens. Can you find any bits of rock?
3. What color is the soil?
4. Rub a pinch of soil between your thumb and forefinger. Describe how it feels.
5. Hold the sample close to your ear and rub. If you hear a scratchy sound, it usually means that sand may be present.
6. Sprinkle water on your sample. Does the soil hold its shape? Can you form it into an object?
7. Measure out 50 ml of soil and estimate its mass. Use the balance and weigh and record the actual mass.

IX. **What the Students Will Do**

1. Collect and examine three soil samples.
2. Describe soil sample by color, composition, and texture.
3. Estimate and measure the mass of soil samples.
4. Compare soil samples.

X. **Discussion**

1. Describe the color of the soil. Is it one color or many colors?
2. How does the soil feel? Describe its texture. Does it feel gritty like sand or wet and sticky like clay?
3. How does it act when you sprinkle water on it? Does it hold its form or shape?
4. In what ways are soils alike? How are they different?
5. Compare the mass of equal volumes of soil. Sequence the soil samples from light to heavy. How do you account for the differences in mass or weight?

XI. **Extension**

1. Study different soil layers. Dig a deep hole, perhaps a meter deep. Or visit a road bank where you can see the soil at least a meter deep. Scrape up and down with a shovel and observe and describe the soils at different depths.

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NAME _____ DATE _____

WHAT MAKES SOIL?

	MY DISCOVERY ABOUT WHAT MAKES SOIL.				
	KIND OF SOIL	COLOR	THINGS IN THE SOIL	HOW IT FEELS	WEIGHT OF SAMPLE
#1					
#2					
#3					

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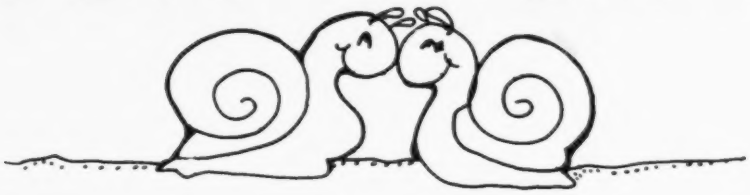
DON'T MIX ME UP



I. **Topic Area**

Soils and their effect on plant growth.

II. **Introductory Statement**

By raising a plant from a seed, students will see which soil mixture promotes the best growth.

III. **Math Skills**

- Measuring
- Fractions
- Problems solving

Science Processes

- Controlling variables
- Observing
- Recording data
- Interpreting data

IV. **Materials**

- potting soil
- sand
- peat moss
- planting containers (styrofoam cups work well)
- Vermiculite (obtain from nursery)
- seeds: bean or pea
- graduated cylinders
- scissors

V. **Key Question**

Which soil mixture is "tastiest" for plants?

VI. **Background Information**

Soil is composed of different materials: vermiculite is non-compactable and provides for water penetration, sand is semi-compactable and provides for water retention, peat moss is non-compactable but provides nutrients. Commercial potting soil mixes these materials in the most beneficial amounts. The amount of these ingredients in soil determines its suitability to plants. The poorer the soil, the more costly it is to raise plants because fertilizers must be added.

VII. **Management**

1. This activity will take one hour the first day.
2. Allow 10 min. every other day for watering and recording results. Allow another hour for discussion on the last day.
3. Soaking seeds overnight will speed germination.

VIII. **Procedure**

1. Review the concept of a fraction and discuss the meaning of ½ in relation to the styrofoam cup.
2. Pass out the soil mixture sheet.
3. Have students write in each plot the fraction of material that will go there.

	Sand	*Peat Moss*	*Potting Soil*	*Vermiculite*
Sand	*½ sand* *½ sand*	*½ peat m.* *½ sand*	*½ pott.soil* *½ sand*	*½ vermic.* *½ sand*
Peat Moss	*½ sand* *½ peat m.*	*½ peat m.* *½ peat m.*	*½ pott.soil* *½ peat m.*	*½ vermic.* *½ peat m.*
Potting Soil	*½ sand* *½ pott.soil*	*½ peat m.* *½ pott.soil*	*½ pott.soil* *½ pott.soil*	*½ vermic.* *½ pott.soil*
Vermic-ulite	*½ sand* *½ vermic.*	*½ peat m.* *½ vermic.*	*½ pott.soil* *½ vermic.*	*½ vermic.* *½ vermic.*

4. Have the students choose which soil mixture they will use. Be sure all possible combinations are assigned.
5. Use a styrofoam cup torn in half as a measuring device. Make sure they use a level amount. Use the same measuring cup for all types of soils in your cup.
6. Have the students plant 2 seeds in opposite sides of the cup. This will insure germination.
7. When the seeds have sprouted, cut off one at ground level. Do not pull it out for this could damage the roots of the other sprout. We cut off one because we only want one sample. Two are too many for such a small plot.
8. Discuss possible variables: water, light, heat. Emphasize controlling these.
9. Water plants with 30 ml of water every other day. The season and temperature of your room may make it necessary to change this amount.
10. Choose a well lit and warm location to store plants.

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XI. **What the Students Will Do**

1. The students will fill out the soil mixture sheet.
2. The students will prepare their soil mixture and plant 2 seeds.
3. The students will be responsible for watering their plants and recording the results.
4. Information to include under observations might include: soil condition, color of plant, direction of plant growth and number and size of leaves.
5. After plants have grown for 2-3 weeks, stop investigation and discuss the results.

X. **Discussion**

1. Which plant looks healthiest? What type of soil was each grown in? (Potting soil combinations)
2. What could we do to improve the growth of the other plants? (Add fertilizer, use less sand and vermiculite)
3. Why don't the ones in sand look as healthy as the ones in potting soil? (The sand provides the nutrients at first but the plant becomes stressed as the small amount of nutrients are depleted.)
4. Why did we increase/decrease the amount of water?
5. How could the cost of food be affected by the use of poor soil to raise crops? (Increased due to the need for fertilizers)

XI. **Extensions**

1. Do the same investigation but make the variable water, temperature or light.
2. Repeat the investigation and add fetilizer to the sand and vermiculite.
3. Test different seeds to see their adaptability to the soil mixture.
4. Order samples of soil from heaviest to lightest.
5. Layer sand, dirt, and leaves in two planter boxes. Water lightly on a weekly basis. Use one as a control and place a handful of worms in the other. Take core samples weekly and compare. Discuss findings.
6. Grow plants in same soil. Water with different liquids such as salt water, soda, beer or wine, Pine Sol, and milk. Observe and discuss.
7. For further fraction study try "Auto" matic Color, Shifty Shadows, Color My World, or Color Spin.

XII. **Curriculum Coordinates**

1. ***Art***—Make a drawing of your plant.
2. ***Economics***—Find out all the ingredients in potting soil.
3. ***Geography***—Find out what vermiculite is.

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NAME _____

DON'T MIX ME UP

WHICH SOIL MIXTURE IS BEST FOR PLANTS?

FILL IN EACH "PLOT" WITH THE FRACTION OF SOIL THAT WILL BE USED.

	SAND	PEAT MOSS	POTTING SOIL	VERMICULITE
SAND				
PEAT MOSS				
POTTING SOIL				
VERMICULITE				

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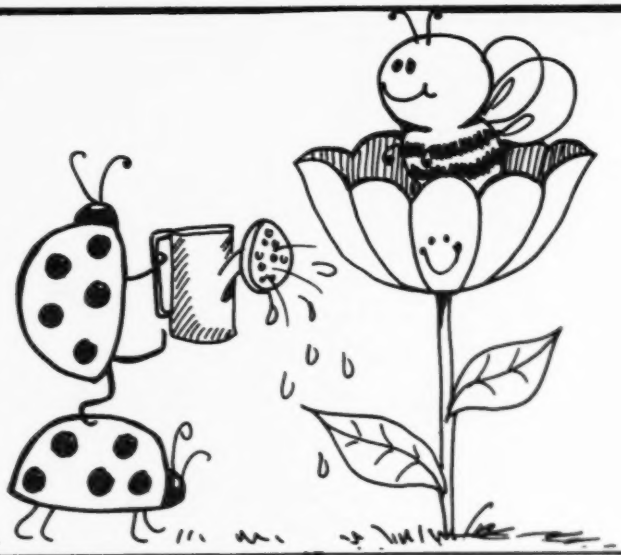
DON'T MIX ME UP



SOIL MIXTURE _____

DATE	AMOUNT OF WATER	OBSERVATIONS	AMOUNT OF GROWTH

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PEANUT BUTTER AND JELLY GEOLOGY

I. **Topic Area**

Geology—Earth's crust

II. **Introductory Statement**

Students will learn how natural forces shape the rock layers of the earth's crust.

III. **Math Skills**

Cardinal and ordinal numbers
Spatial relationships
Sequencing
Problem solving

Science Processes

Observing
Hypothesizing

IV. **Materials**

For each pair of students:
one slice of white bread
one slice of whole wheat bread
one slice of dark rye bread
two tablespoons of jam or jelly
two tablespoons of peanut butter (crunchy) mixed with raisins
two paper plates
wooden tongue depressor (or plastic knife)
measuring spoons for serving jelly

For optional demonstration by teacher:
electric soldering iron

V. **Key Question**

How do natural forces shape the rock layers of the earth's crust?

VI. **Background Information**

This should not be a first experience with rock layers. Students should have some knowledge of the appropriate vocabulary.

VII. **Management**

1. This activity takes 45 to 60 minutes.
2. Make sure that the sandwiches remain right side up while the students are making them (white bread on the bottom).
3. Having students bring in ingredients helps keep the cost minimal.
4. It is more manageable to work in groups of two students sharing a sandwich.
5. Parent volunteers to set up the ingredients on paper plates ahead of time is also a great help.

VIII. **Procedure**

1. Have students work in pairs. Each pair will need a paper plate with the described ingredients.
2. Tell the students you will show them how to make and manipulate a sandwich in the same way that natural forces shape layers of rock.
3. Have the students call the layers just what they are unless you have been stuyding rocks and they are familiar with the rock layer names. They can use imaginative rock names such as wholesome shale for whole wheat bread or sticky conglomerate for chunky peanut butter.

RYE BREAD - Brown Sandstone
JELLY - Limestone
WHOLE WHEAT BREAD - Shale
CHUNKY PEANUT BUTTER - Conglomerate
WHITE BREAD - White Sandstone

4. Have all students place the white bread on a paper plate. Next, spread the chunky peanut butter. Add the whole wheat bread, jelly, and rye bread. All students should have identical three layer sandwiches.
5. As the students build their sandwiches, keep track of their progress by drawing a diagram on the chalkboard.
6. When all the sandwiches are finished start a question and answer period. See discussion questions.
7. When geologists study layers of rock, they rarely find them flat and horizontal. Often they will see layers that are bent or broken. To illustrate these structures, have the students gently bend their sandwich to form a hill. (Always keeping the oldest layer on the bottom). This is called an ANTICLINE. Have the students bend the sandwich to form a trough. They now have a SYNCLINE. Mountains and valleys are formed in this way.

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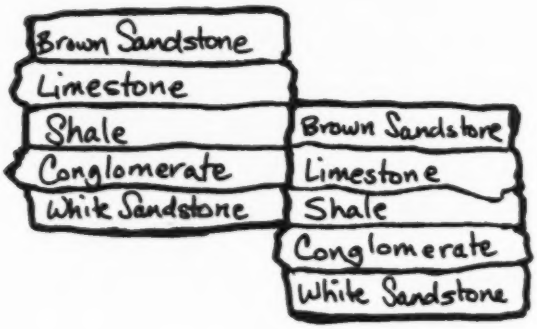
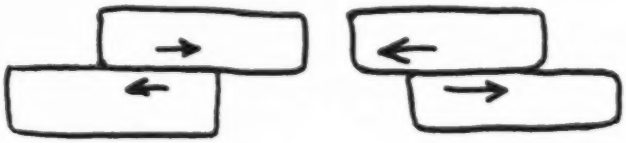
8. Sometimes the crust of the earth moves up or down. In part, this movement causes earthquakes. Cut your sandwich in half and move one half up or down. Hold the two halves up in front of you. Which side moved up or down? Either the left side moved up and the right side moved down or the other way around. You can see this movement because of the different layers of the sandwich. This is called a vertical fault. Have students draw this on their papers.



9. Another kind of fault is the lateral fault. Slide the two parts of the sandwich past each other on the same level.
10. Draw diagrams on the board.



11. ***Lava and Magma***

    Predicting the age of rocks is not always as simple as calling the bottom layer the oldest and the top layer the youngest. Sometimes hot, molten lava pours out over the countryside and is later buried. At other times, hot, molten lava (magma) will squeeze in between layers of rock already buried. Both the surface lava flow and the intrusive layer of magma are igneous rocks. Suppose you came across a cross section of rock layers in a road cut or building excavation. It had the following kinds of rocks in order from top to bottom: sandstone, igneous, limestone, shale, igneous, sandstone. Draw layers on the board. How could you tell which was the lava flow and which was the intrusive magma? Allow theorizing.
12. ***Teacher demonstrates*** (optional—12-13)

    Hold two layers of bread together like a sandwich and push the hot soldering iron in between the two layers for a few moments. Take the soldering iron out and ask one student to tell the class what he or she observes about the two pieces of bread. The student should report that both pieces of bread are burnt or toasted where the iron was pushed in.
13. Keep the sandwich together and place the soldering iron on top of the upper surface of the top piece of bread. Remove the iron, place a third piece of bread on top of the first two. Ask another student to describe the layers now. The students should report that the top of the middle piece of bread is burnt, but the bottom of the upper piece isn't because it was put on after the soldering iron was taken away.
14. Ask the class how they could tell the difference between the surface lava flow and the intrusive magma.
15. In actual rock layers they would be able to see the effects of the heat. The shale would be baked to form hornfels, a type of rock that is harder, brittler and more dense than shale. In sandstone, the grains of sand would be slightly melted together to form a glazed texture.
16. Students can now eat their rock layers.

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IX. **What the Students Will Do**

See above procedure

X. Discussion

1. It took about ten minutes for everyone to build their sandwich. What is the oldest part? (bottom layer)
2. Why do you say that? (it was put on first—everything else went on top of it.
3. What is the youngest layer of the sandwich? (top piece)
4. Why do you say that? (last thing put on)
5. What is the age of the shale or wheat bread? (halfway between oldest and youngest—it is in the middle)
6. That could be right if we build our sandwich adding one layer each minute for five minutes. Suppose we started slowly then speeded up. The middle layer wouldn't be middle in age any longer. Who can tell me the best way to describe the age of the shale or wheat bread? (it is younger than the conglomerate or peanut butter and older than the limestone or jelly)
7. Can anyone tell me the best way to determine the age of the limestone layer? The conglomerate layer? In any sandwich that is right side up (or a layer not overturned) how can we best describe the age of any particular layer? (any one layer is older than what is under it and younger than what is on top of it)

XI. **Curriculum Coordinates**

1. ***Art***—Draw pictures of rock formations that are not horizontal. Make up stories as to what happened.
2. ***Language Arts***—Suppose you could dig all the way to China. Describe what you would find along the way.
3. ***Social Sciences***—Do extended research on volcanoes and earthquakes. Research the benefits of volcanoes. How are pumice and obsidian alike and different? How are they each formed?

GEOLOGY DEFINITIONS

stratum—a bed or layer of rock

fault—rupture or break in the earth's layers caused by squeezing and stretching from forces within the earth

anticline—when a hill is formed

syncline—when a trough or valley is formed

sandstone—a sedimentary rock made of sand held together by a cement of silica or the like

limestone—hard rock

shale—soft, fine grained rock formed from clay or mud that splits easily into thin layers

conglomerate—a mixture of different rocks held together by a cementing material

lateral fault—sideways movement of earth's surface

lava—cooled magma that has come to the earth's surface

magma—melted rock deep in the earth

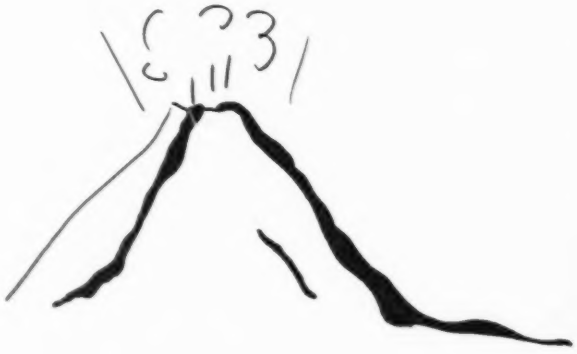
igneous rock—fire or volcanic action formed rock

pumice—light, spongy stones thrown up by volcanoes

obsidian—volcanic glass; a hard dark glassy rock that is formed when lava cools

hornfels—a hard compact rock formed by action of intrusive rock upon shale

earthquake—shaking, rolling, or sudden shock of the earth's surface



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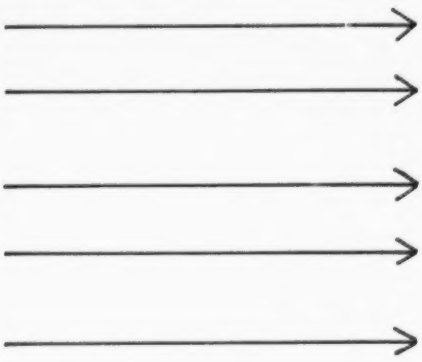
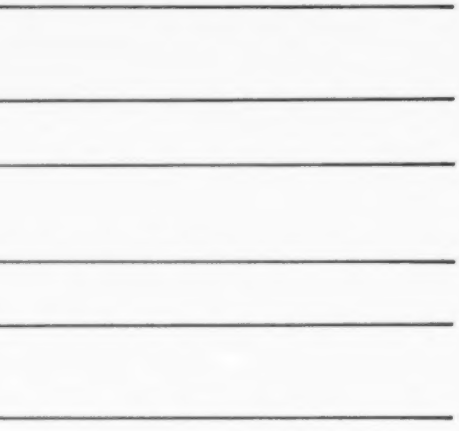
NAME _____

PEANUT BUTTER AND JELLY GEOLOGY

MATERIALS

ROCK LAYER NAMES





GEOLOGICAL STRUCTURES

1. ON THE BACK SIDE OF THIS PAPER DRAW A SIDE VIEW OF A VERTICAL FAULT AND LABEL THE LAYERS.

2. ON THE BACK SIDE OF THIS PAPER DRAW A TOP VIEW OF A LATERAL FAULT.

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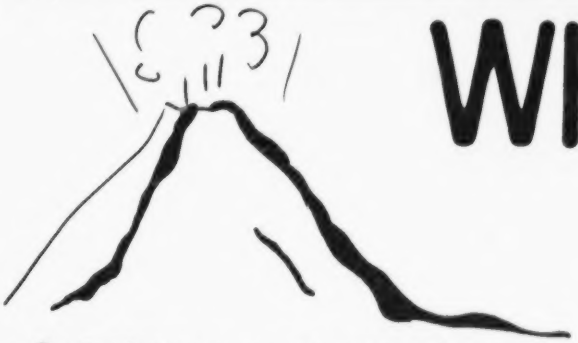
NAME _____



WHO AM I?

DIRECTIONS: SELECT FROM THE COLUMN AT THE LEFT THE WORD WHICH IS MOST APPROPRIATE TO THE DEFINITION AT THE RIGHT. PUT THE NUMBER OF THE WORD IN THE PROPER SPACE IN THE MAGIC SQUARE BOX. IF YOUR ANSWERS ARE CORRECT, EACH ROW, COLUMN, AND DIAGONAL WILL ADD TO THE MAGIC NUMBER

ANSWERS

1. ANTICLINE
2. SYNCLINE
3. CONGLOMERATE
4. BROWN SANDSTONE
5. LIMESTONE
6. SHALE
7. WHITE SANDSTONE
8. LATERAL FAULT
9. LAVA
10. MAGMA
11. EARTHQUAKE

A	B	C
D	E	F
G	H	I

DEFINITIONS

A. THE LAYER OLDER THAN BROWN SANDSTONE BUT YOUNGER THAN SHALE.

B. A HOT MOLTEN INTRUSIVE LAYER

C. A MIXTURE OF DIFFERENT ROCKS HELD TOGETHER BY A CEMENTING MATERIAL.

D. THE YOUNGEST LAYER IN YOUR SANDWICH.

E. THE LAYER OLDER THAN LIMESTONE BUT YOUNGER THAN CONGLOMERATE.

F. SIDEWAYS MOVEMENT OF THE EARTH'S SURFACE.

G. THE FLOW FROM A VOLCANO ON THE SURFACE OF THE EARTH.

H. WHEN A TROUGH OR VALLEY IS FORMED.

I. THE OLDEST LAYER IN YOUR SANDWICH.

MAGIC SQUARE SUM _____